

**RENOVATION AND REPAIR OF THE
GEORGE A. AYOTTE AND JOSEPH M. DOWNES
PARKING FACILITIES
LOWELL, MASSACHUSETTS**

February 22, 2022

100% DESIGN DOCUMENTS



Prepared For:

**City of Lowell
City Hall
375 Merrimack Street, 3rd Floor
Lowell, MA 01852**

Prepared By:

**Gale Associates, Inc.
163 Libbey Parkway
Weymouth, MA 02189**

GALE JN 837920

This Page Intentionally Left Blank.

TABLE OF CONTENTS

Title Page
Table of Contents

DIVISION 01 – GENERAL REQUIREMENTS

| | |
|------------------|---|
| Section 01 11 00 | Summary of Work |
| Section 01 22 00 | Unit Prices |
| Section 01 30 00 | Shop Drawings and Submittals |
| Section 01 50 00 | Temporary Facilities |
| Section 01 63 00 | Weather Protection and Material Storage |
| Section 01 70 00 | Project Close-Out |

DIVISION 03 – CONCRETE

| | |
|------------------|---------------------------------------|
| Section 03 01 30 | Maintenance of Cast-in-Place Concrete |
| Section 03 30 00 | Cast-In-Place Concrete |

DIVISION 04 – MASONRY

| | |
|------------------|--|
| Section 04 20 00 | Masonry Work Filed Sub-Bid Requirements |
| Section 04 50 00 | Masonry (Filed Sub-Bid included with 04 20 00) |

DIVISION 06 – ROUGH CARPENTRY

| | |
|------------------|-----------------|
| Section 06 10 00 | Rough Carpentry |
|------------------|-----------------|

DIVISION 07 – THERMAL AND MOISTURE SYSTEMS

| | |
|------------------|---|
| Section 07 10 00 | Traffic Coatings and Joints Filed Sub-Bid Requirements |
| Section 07 18 00 | Vehicular Traffic Coatings (Filed Sub-Bid included with 07 10 00) |
| Section 07 42 13 | Metal Wall Panels |
| Section 07 50 00 | Roofing and Flashing Filed Sub-Bid Requirements |
| Section 07 53 00 | Elastomeric Roofing and Flashing (Filed Sub-Bid included with 07 50 00) |
| Section 07 62 00 | Sheet Metal Flashing and Trim |
| Section 07 91 20 | Expansion Joints (Filed Sub-Bid included with 07 10 00) |
| Section 07 92 00 | Joint Sealants (Filed Sub-Bid included with 07 10 00) |

DIVISION 08 – OPENINGS

| | |
|------------------|--|
| Section 08 40 00 | Openings Filed Sub-Bid Requirements |
| Section 08 50 00 | Storefronts and Entrances (Filed Sub-Bid included with 08 40 00) |

DIVISION 09 – PAINTING

Section 09 90 00 Exterior Painting

DIVISION 22 – PLUMBING

Section 22 00 00 Plumbing Filed Sub-Bid Requirements
Section 22 30 00 Plumbing (Filed Sub-Bid included with 22 00 00)

DIVISION 26 – ELECTRICAL

Section 26 00 00 Electrical Filed Sub-Bid Requirements
Section 26 05 10 Electrical Special Conditions (Filed Sub-Bid included with 26 00 00)
Section 26 05 20 Basic Materials and Methods (Filed Sub-Bid included with 26 00 00)
Section 26 05 30 Wiring Methods (Filed Sub-Bid included with 26 00 00)
Section 26 20 10 Low Voltage Distribution (Filed Sub-Bid included with 26 00 00)

DIVISION 32 – EXTERIOR IMPROVEMENTS

Section 32 17 23 Pavement Markings

APPENDIX A – ELECTRICAL NARRATIVES

CONTRACT DRAWINGS

| <u>DRAWING NO.</u> | <u>TITLE</u> |
|--------------------|---|
| G100 | Cover Sheet |
| A101 | Penthouse Roof Area Plans |
| A201 | Joseph M. Downes Garage Elevations |
| A202 | Joseph M. Downes Garage Elevations |
| A203 | Joseph M. Downes Garage Elevations |
| A204 | Joseph M. Downes Garage Elevations |
| A205 | Joseph M. Downes Garage Elevations |
| A206 | Joseph M. Downes Garage Penthouse and Hidden Elevations |
| A207 | Joseph M. Downes Garage Elevations |
| A208 | George A. Ayotte Garage Elevations |
| A209 | George A. Ayotte Garage Elevations |
| A210 | George A. Ayotte Garage Elevations |
| A211 | George A. Ayotte Garage Penthouse Elevations |
| A212 | George A. Ayotte Garage Penthouse Elevations |
| A213 | George A. Ayotte Garage Penthouse Elevations |
| A214 | George A. Ayotte Garage Penthouse Elevations |
| A215 | Joseph M. Downes Storefront Elevations |
| A501 | Roof Details |
| A502 | Roof Details |

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

| | |
|------|--|
| A503 | Roof Details |
| A701 | Masonry Details |
| A801 | Storefront Details |
| A802 | Storefront Details |
| S001 | Structural Notes |
| S101 | Joseph M. Downes Garage Lower Level Plan |
| S102 | Joseph M. Downes Garage Underside of First Level Plan |
| S103 | Joseph M. Downes Garage First Level Plan |
| S104 | Joseph M. Downes Garage Underside of Second Level Plan |
| S105 | Joseph M. Downes Garage Second Level Plan |
| S106 | Joseph M. Downes Garage Underside of Third Level Plan |
| S107 | Joseph M. Downes Garage Third Level Plan |
| S108 | Joseph M. Downes Garage Underside of Fourth Level Plan |
| S109 | Joseph M. Downes Garage Fourth Level Plan |
| S110 | Joseph M. Downes Garage Underside of Fifth Level Plan |
| S111 | Joseph M. Downes Garage Fifth Level Plan |
| S112 | Joseph M. Downes Garage Underside of Roof Level Plan |
| S113 | Joseph M. Downes Garage Roof Level Plan |
| S114 | George A. Ayotte Garage Ground Floor Plan |
| S115 | George A. Ayotte Garage Underside of Second Floor Plan |
| S116 | George A. Ayotte Garage Second Floor Plan |
| S117 | George A. Ayotte Garage Underside of Third Floor Plan |
| S118 | George A. Ayotte Garage Third Floor Plan |
| S119 | George A. Ayotte Garage Underside of Fourth Floor Plan |
| S120 | George A. Ayotte Garage Fourth Floor Plan |
| S121 | George A. Ayotte Garage Underside of Fifth Floor Plan |
| S122 | George A. Ayotte Garage Fifth Floor Plan (Partial Roof) |
| S123 | George A. Ayotte Garage Underside of Sixth Floor Roof Plan |
| S124 | George A. Ayotte Garage Sixth Floor Roof Plan |
| S501 | Structural Details |
| S502 | Structural Details |
| S503 | Structural Details |
| S504 | Joseph M. Downes Garage Temporary Shoring Detail |
| E000 | Electrical Legend and General Notes |
| E101 | Downes Garage – Level 1 – Electrical Plan |
| E102 | Ayotte Garage – Level 2 – Electrical Plan |

END OF SECTION

I:\837920\02 Design\specs\837920 00 00 01 TOC.doc

This Page Intentionally Left Blank.

SUMMARY OF WORK

SECTION 01 11 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

The Work shall include all permitting, demolition, surface preparation, testing, temporary protection, phasing, placement and maintenance of barriers, labor, equipment, materials and accessories necessary to perform all renovations associated with the repairs at the George A. Ayotte Parking Facility and Joseph M. Downes Parking Facility, in Lowell, MA, in accordance with the Contract Documents. Refer to the appropriate specification section for further information about preparation and installation methods with components to be provided. Refer to the Contract Drawings for limits of scope of work. In general, the work includes, but is not limited to, the items listed below:

- A. Supply all necessary chutes, disposal facilities, transportation, and labor necessary to dispose of all demolished materials, dirt, and debris off-site in a legal dumping area. The Contractor shall obtain all permits necessary to transport and dispose of all materials, rubbish and debris affected by their scope of work.
- B. Prior to removal of existing traffic coating, contractor shall field measure and provide fully dimensioned as-built drawing indicating layout of parking spaces, no-parking zones, directional arrows, etc.
- C. Remove existing traffic coating from the parking garage deck in locations indicated on the Contract Documents via partial depth hydro-demolition or Engineer's approved equivalent. All existing waterproofing remnants (including sealant, mastic, flashing, primer, etc.), loose concrete, existing sealants, etc. shall be fully removed down to bare, solid, and open capillary concrete (as specified). (Unit Price Item)
- D. Install new traffic coating in locations indicated on the Contract Documents. (Unit Price Item)
- E. After complete cure of the traffic coating system, apply traffic marking paint to match original configuration. Use stencils as required to provide straight, consistent traffic markings.
- F. Repair deep and shallow spalled concrete (topside and Underside) where indicated on the Contract Drawings. (Unit Price Items)

- G. Repair delaminated concrete (topside and Underside) where indicated on the Contract Drawings. (Unit Price Items)
- H. Repair cracked concrete via epoxy injection or route and seal application where indicated on the Contract Drawings. (Unit Price Item)
- I. Remove existing deck drains and install new drain assemblies including, but not limited to, cast iron drain bowls, grates, gaskets, associated hardware, and cast-in-place concrete setting bed at locations as indicated on the Contract Drawings. (Unit Price Item)
- J. Replace deteriorated drain leader lines connected to the drains indicated to be removed and replaced on the Contract Drawings. (Unit Price Item)
- K. Repair existing double tee beam flange to flange connections observed to be broken in the field after removal of joint sealant and backer rod. Quantities listed on the Contract Drawings have been approximated. (Unit Price Item)
- L. Remove, flash, and replace displaced parapet concrete capstones at locations indicated on the Contract Drawings.
- M. Remove, flash, and re-install all existing parapet capstones which are not indicated as being removed and replaced on the Contract Drawings. (Unit Price Item)
- N. Remove the existing traffic coating system and install new traffic coating system as detailed on the Contract Drawings and specified herein. (Unit Price Item)
- O. Remove the existing parking deck joint sealants and install joint sealant at all precast concrete to precast concrete joints including, but not limited to, double tee beam to double tee beam joints, double tee beam to inverted tee beam joints, double tee beam to spandrel beam or wall joints, inverted tee beam to vertical surfaces, and all precast concrete joints at interface with cast-in-place concrete elements. (Unit Price Item)
- P. Remove the existing expansion joints at each level at the George A. Ayotte Parking Facility, cut/modify the existing double tee beam flanges to accommodate the installation of the winged expansion joint, and install the new expansion joints as indicated on the Contract Drawings. (Unit Price Item)
- Q. Install cant bead of sealant at all rising parapet walls and at all joints indicated on the Contract Drawings.
- R. Remove and replace cracked or spalled brick masonry at locations indicated on the Contract Drawings. (Unit Price Item)
- S. Repoint deteriorated brick masonry joints at locations indicated on the Contract Drawings. (Unit Price Item)

- T. Install throughwall flashing at the brick masonry rising wall at locations indicated on the Contract Drawings.
- U. Install helical ties at the brick masonry rising wall at locations indicated on the Contract Drawings.
- V. Remove and replace the existing roofing materials and metal wall panels at the stair towers at locations indicated on the Contract Drawings. (Unit Price Item)
- W. Remove and dispose of the steel cornice structure mounted to the roof level parapets at the Joseph M. Downes Parking Facility, and patch anchor holes from steel attachments, where indicated on the contract drawings.
- X. Remove and replace existing storefront and entrance system at the Joseph. M. Downes Parking Facility as indicated on the contract Drawings.
- Y. Provide temporary shoring of the structure as indicted on the Contract Drawings to perform the basement level concrete repairs at three (3) column pier locations. Provide shop drawings and calculations stamped by a structural engineer licensed in the State of Massachusetts.
- Z. Complete all associated work in accordance with the project specifications.
- AA. Clean and restore all areas affected by the work.
- BB. Coordinate the work with that of the Owner.
- CC. Perform all other miscellaneous work as required to complete the project in its entirety.

1.3 CONTRACTORS USE OF PREMISES/WORK LIMITATIONS

- A. The parking garage is a public access garage that will be in use during construction. Contractor shall provide temporary barricades, lighting, signs, etc. as required to segregate work area from public. While working on the top deck, it is anticipated the entire top deck will be closed to the public. Barricades shall be placed at entry ramp, both stairwells and elevator. Elevator must be "locked-out" to prevent accidental access to levels receiving work or construction operations.
- B. Contractor shall coordinate with the Owner to limit elevator access.

1.4 WORK HOURS

- A. The Contractor will be allowed to work at the project site between the hours of 7:00 a.m. and 5:00 p.m., local time. The Owner reserves the right to disapprove or suspend a request to work outside of normal working hours.

- B. Should the Contractor's work hours extend beyond the scheduled hours as stated above for the project due to improper staffing, a lack of daily on-site production, shortage of materials, or other factors within the Contractor's control, the Contractor shall be responsible for bearing the overtime cost for the Owner of providing custodial, engineering, construction monitoring and other services directly related to the construction.

1.5 PROJECT CONDITIONS

- A. The Owner shall review the Contractor's work schedule submittal prior to the start of any work on this project. The Contractor's work schedule shall clearly define the location and type of work to be performed each day during the Contract.
- B. The Contractor shall provide accurate record drawings, outlining the actual repairs and renovation work at the completion of this project. The intent of the record drawings are to outline areas of repairs that have been performed, as well as provide a future work plan for potential other renovations that will be required. The Contractor will be required to present the draft record drawing set at each of the project meetings to confirm the documentation is being complete. The Contractor will be required to submit the documents to the Designer at the completion of the project for review and final submission to the Owner.
- C. The Contractor shall provide a full-time English speaking project superintendent to coordinate the daily construction, daily clean-up and discuss procedures with the building tenants.
- D. The Contractor shall supply, install and maintain all barriers, overhead protection, warning lines, lighting and personnel required to segregate the work area(s) and to prevent damage to the buildings, their occupants, adjacent buildings and surrounding landscaped and paved areas. All applicable OSHA requirements shall be observed by the Contractor.
- E. The garage and site will be occupied and in use during construction. The Contractors shall take all necessary precautions to create as little disturbance or disruption to the building and their occupants as possible during the course of the work. No loud noise, radios, etc. will be allowed on the job site.
- F. The Contractor shall be professional and courteous to all residents and the general public. Any employee acting non-professional or presents lewd comments will be removed permanently from the site.
- G. Mechanical and electrical disconnection, extension, rerouting and reconnection may be required in order to install the new work. This work shall be the responsibility of the Contractor and shall be performed by licensed tradesmen in accordance with applicable codes and standards. Should disconnection of electrical conduits be required, a licensed electrician will be responsible for applying for, obtaining, and receiving a final signature for all electrical permits.

- H. The Contractor shall be responsible for submitting all required permits. This shall include, but not be limited to, building, fire, and dumping. The Contractor shall be responsible for all police and fire details as required to properly complete the work.
- I. The Owner requires the Contractor(s) to conform to all requirements of this specification as well as those of the system manufacturer.
- J. All materials and workmanship shall be of the best construction practice. Refer to the requirements of the manufacturer and these specifications for handling and installation of all materials.
- K. Protect the garage and site areas not included in the construction. The Contractor shall replace or repair all garage or site components damaged as a result of the construction to the satisfaction of the Owner, at no additional cost to the Owner.
- L. Supply all labor, equipment, tools, appliances, shoring, supports or other items required to properly support, elevate and protect fixtures, equipment, and facilities affected by the work and to properly install the work.
- M. Supply all necessary disposal facilities, transportation and labor necessary to dispose of all demolished materials, dirt and debris off-site in a legal dumping area. The Contractor shall obtain all permits necessary to transport and dispose of all materials, rubbish and debris.

1.6 PRECONSTRUCTION CONFERENCE

- A. A Preconstruction Conference will be held with the Owner, Engineer, Contractor, Coating Material Manufacturer Representative, and all involved trades to discuss all aspects of the project. The Contractor's foreman or field representative will attend this Conference. The Conference will not be held until all shop drawings and submittals have been received and reviewed by the Owner and the Engineer.
- B. The Contractor shall coordinate with the traffic coating manufacturer to be present at the Preconstruction Conference, (no exceptions).

1.7 CONSTRUCTION SCHEDULE

- A. The Owner shall review the Contractor's Construction Schedule prior to the start of any work. The Contractor shall submit the original schedule in accordance with Section 01 30 00 - Shop Drawings and Submittals, and shall update his Construction Schedule and submit a copy each week to the Owner for review.

1.8 DIMENSIONS AND QUANTITIES

- A. All dimensions and quantities shall be field-verified by the Contractor. The Contract Documents have been compiled from various sources, and may not reflect the actual field conditions at the time of construction.

- B. The Contractor is cautioned to take all necessary precautions and make all necessary investigations to properly supply, fabricate and install the proposed work.
- C. The Owner will not consider unfamiliarity with the project as a basis for any additional compensation.
- D. The general nature, quantity and distribution of the various work items are shown on the Contract Drawings.

1.9 GUARANTEES

A. Contractor Guarantee

Upon completion of the work, and prior to final payment, the General Contractor and all Sub-Contractors shall submit a Guarantee of his work to be free from defect in materials and workmanship. This Guarantee shall be for a period of two (2) years, and shall be signed by a Principal of the Contractor's firm, and sealed if a corporation. The General Contractor guarantee must also include a two (2) year guarantee of the sub-contractor's work.

B. Traffic Coating Warranty

Upon completion of the work, and prior to final payment, the Contractor shall submit manufacturer's five (5) year warranty.

C. Joint Sealant Warranty

Upon completion of the work, and prior to final payment, the Contractor shall submit manufacturer's five (5) year warranty.

D. Traffic Marking Warranty

Upon completion of the work, and prior to final payment, the Contractor shall submit manufacturer's five (5) year warranty.

E. Other

Refer to the technical sections included in this document for additional guarantees associated with this project.

1.10 QUALITY ASSURANCE OVERVIEW

- A. The Contractor is required to contact, coordinate, and pay for (as applicable or required) all field visits and quality review services by the traffic coating material manufacturer for the duration of the project; and as designated herein.
- B. The coating material manufacturer is required to perform site visits to review each mock-up application. A written field report must be submitted for each site visit.

- C. The coating material manufacturer is required to perform a minimum of two (2) individual site visits on different days each week for the duration of any and all coating work. A written field report must be submitted for each site visit.
- D. As a minimum, the coating material manufacturer must review and report on the following:
 - 1. Surface preparation and acceptability.
 - 2. Mixing, application and curing of primer.
 - 3. Mixing, application and curing of neoprene waterproof coat.
 - 4. Mixing, application and curing of each coal tar epoxy layer including aggregate.
 - 5. Repeat reviews of mock-ups until acceptable results are achieved.
 - 6. Installation of traffic coating system at sealed control and construction joints.

1.11 CLEAN-UP

Restore property of the Owner to its original condition prior to project close-out. Refer to Section 01 50 00, TEMPORARY FACILITIES. General clean-up of the site shall be performed on a daily basis.

- A. Clean, restore and/or replace items stained, dirtied, discolored or otherwise damaged due to the Work, as required by the Owner.
- B. Clean garage (interior and exterior), roof areas, landscaped and parking areas so they are free of trash, debris and dirt caused by, or associated with the Work.
- C. The Contractor will be required to repair all existing landscaping that is trafficked as required to complete the work. Brushes/trees damaged shall be pruned by a professional arborist prior to final payment.
- D. Sweep paved areas clean.
- E. Site clean-up shall be performed daily.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 11 00 - Summary of Work.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

UNIT PRICES

SECTION 01 22 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

This Section contains instructions and references other Contract Documents that relate to Unit Prices. The Owner may elect certain aspects of the work, whose quantities cannot be determined at this time, to be performed or deleted by the Contractor. If such work items are elected, the Contract price will be adjusted by the Unit Price amount shown for each item in the Bid Forms.

- A. A Unit Price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. The Bidders shall submit with their Bids, prices for the performance of Unit Price work. The scope of the Unit Price work is defined within this section.
- C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.
- D. The specific quantities of Unit Price Work included in the Base Bid are provided herein. This applies to items whose exact quantities are unknown but are anticipated to exist, for example, deteriorated roof decking.
- E. The quantities of Unit Price Work listed in this Section and the bid and contract forms are in addition to the quantities shown on the Contract Drawings (if any).
- F. The Unit Prices requested herein shall include a pro-rata share of all costs for materials, labor, equipment costs, overhead, profit, and applicable taxes.

- G. Where not otherwise specified, Unit Prices cover net costs and credits to the Owner for executing authorized changes in the Work. No separate adjustments are made for labor, materials, transportation, handling, storage, overhead, profit, or other related work expenses.
- H. If unit price quantities vary greater than twenty (20) percent above the amounts carried in the Base Bid, the Owner reserves the right to re-negotiate lower unit price costs. The Contractor will be required to notify the Owner once they approach this limit as the work progresses.

1.3 SCOPE OF WORK

- A. The Unit Prices for items of Work, as set forth in the Schedule of Unit Prices, shall be used to determine adjustments to the Contract Amount when changes in the Work involving said items are made in accordance with the Contract Documents.
- B. Materials, methods of installation, and definitions of terms set forth under the various Unit Price items in the Schedule of Unit prices shall be as indicated in the Contract Documents.
- C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.

1.4 APPLICABILITY OF UNIT PRICES

- A. Prior to commencing removal or replacement of materials set forth in the schedule of Unit Prices, the Contractor shall notify the Owner in sufficient time to permit proper inspection and measurements to be taken. Only quantities that have been approved in writing by the Owner will be considered in the determination of adjustments to the Contract Sum.
- B. Unit Price Work includes providing and installing all accessories and appurtenant work necessary to properly execute the Unit Price Work.
- C. Performance of work not required by the Contract Documents, or which is not authorized by Change Order or Field Order, whether or not such work is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Owner.

1.5 VERIFICATION OF UNIT PRICE QUANTITIES

The following minimum procedures must be included by the Contractor for each of the indicated unit repair items for the duration of the project:

- A. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices and estimated quantities. Methods of measurement and payment for unit prices and estimated quantities are as follows:
1. For work covered by scheduled quantities, notify the Owner and Engineer a minimum of 24 hours in advance of the performance of such work.
 2. Document such work in writing, identifying type of work, quantity and location of work. Submit documentation on Contractor's letterhead.
 3. All documentation of work covered by scheduled quantities will be subject to verification and approval by the Owner and Engineer.
 4. In order to be considered for payment, documentation for work covered by scheduled quantities shall be submitted within one month of performance of such work. Requests for payment of such work submitted more than one month after the work has been performed will not be accepted.
 5. Only documentation signed and verified by the Contractor, Trade, and the Owner's Representative will be considered valid. Documentation not signed by all these parties will be considered invalid.
- B. The Contractor shall contact the Owner and Engineer if a Unit Price quantity is anticipated to be reached prior to exceeding that quantity. No additional costs will be awarded to the Contractor for additional Unit Price Work without written approval from the Owner and/or Engineer.
- C. The Contractor must provide safe, adequate, and ample access to the Owner and Engineer for verification of the Unit Price Work throughout the course of construction.
- D. The Contractor is required to track, and record actual placed and completed Unit Price Work throughout the course of construction and submit a breakdown to the Owner and Engineer on a weekly basis or as requested. The breakdown shall include the following for each Unit Price item:
1. Completed quantity to date
 2. Remaining quantity to date
 3. Percentage of total quantity remaining

1.6 UNIT PRICE SCHEDULE

The following unit prices as defined in the specifications are designated for items of work on the basis of unknown quantities or quantities estimated by the Engineer. These unit prices will be used to add or to deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount.

The unit prices listed below are above and beyond that shown on the Contract Drawings and shall be included by the Contractor under the appropriate Base Bid Scope of Work. The Contractor's Schedule of Values will carry each item under the bid amount selected for this project. Should the unit price work not be performed on this project, the total amount, or remaining amount if portions of unit price work are performed, shall be credited to the Owner.

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

Unit Prices

Base Bid:

| No. | Section | Item | Quantity Carried | Unit of Measure | Unit Price Dollars/Cents | Total Amount Dollars/Cents |
|-----|----------|--|---------------------|--------------------|-----------------------------|-------------------------------|
| 1 | 03 01 00 | Repair Topside Concrete (Deep Spall) | 100 | Square Feet | \$ | \$ |
| 2 | 03 01 00 | Repair Topside Concrete (Shallow Spall) | 100 | Square Feet | \$ | \$ |
| 3 | 03 01 00 | Repair Underside Concrete (Deep Spall) | 100 | Square Feet | \$ | \$ |
| 4 | 03 01 00 | Repair Underside Concrete (Shallow Spall) | 100 | Square Feet | \$ | \$ |
| 6 | 03 01 00 | Route & Seal Cracked Concrete | 100 | Linear Feet | \$ | \$ |
| 7 | 03 01 00 | Epoxy Inject Cracked Concrete | 50 | Linear Feet | \$ | \$ |
| 7 | 03 01 00 | Repair Flange to Flange Connector | 2,000 | Unit | \$ | \$ |
| 8 | 04 50 00 | Repoint deteriorated mortar joints | 200 | Linear Feet | \$ | \$ |
| | 04 50 00 | Remove and Replace Spalled/ Cracked Brick | 100 | Units | \$ | \$ |
| 8 | 07 18 00 | Remove Existing Traffic Coating | 2,200 | Square Feet | \$ | \$ |
| 9 | 07 18 00 | Install New Traffic Coating | 2,200 | Square Feet | \$ | \$ |
| 10 | 07 92 00 | Remove and Replace Existing Joint Sealant | 32,380 | Linear Feet | \$ | \$ |
| 11 | 07 92 00 | Remove and Replace Existing Expansion Joints | 120 | Linear Feet | \$ | \$ |
| 12 | 22 30 00 | Replace Drain and Leaders to Main Line | 20 | Unit | \$ | \$ |

UNIT PRICES
01 22 00-4

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 22 00 - Unit Prices.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

SHOP DRAWINGS AND SUBMITTALS

SECTION 01 30 00

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 SCOPE

The following submittals will be required of all construction materials and systems:

- A. List of materials stating manufacturer's name and address, as well as material trade name and manufacturer's designation.
- B. Shop Drawings.
- C. Samples.
- D. Catalog Data.
- E. Manufacturer's Instructions.
- F. Mock-ups.
- G. Construction Photographs.
- H. Contractor's Schedule as it affects the contracted completion date and sequence of construction, updated each week during the construction phase.
- I. Material Safety Data Sheets (MSDS).
- J. As-built renovation drawings developed by the Contractor.
- K. Pre-condition survey plan of all existing parking lane paint lines, cross hatch patterns and arrows.
- L. Material manufacturer field reports.

1.3 TIME OF SUBMITTALS

The following submittals are required during the various phases of the Contract. Each submittal item shall have the technical section and paragraph number clearly indicated. All submittal items without the proper designations will be returned and will not be reviewed.

- A. Bid Submission: shall include three (3) copies of the following information and submittals:
 - 1. List of Materials and Manufacturers. Include system designations and manufacturer's literature, and a sample of manufacturer's warranties.
 - 2. Construction Schedule showing the sequence of construction, starting date, completion date and weekly status checklist.

- B. Contract Submissions: After the successful Bidder has received the Notice to Proceed or Letter of Intent to Enter the Contract, the Bidder shall, within ten (10) working days, provide three (3) copies of the following submittals to the Engineer:
 - 1. Complete Materials List.
 - 2. Manufacturer's Technical Literature as selected.
 - 3. Manufacturer's Instructions.
 - 4. Catalog Data ("SPEC-DATA" Sheets).
 - 5. Material Safety Data Sheets (MSDS).
 - 6. Samples of all materials including caulking, sealers, fasteners and sheet metal. Include coating samples (three minimum) on minimum 4" x 4" size boards to clearly match actual project specified primer, neoprene waterproofing layer and all epoxy/aggregate layers. Samples must include actual specified thicknesses and aggregate type and size.
 - 7. Shop Drawings.
 - 8. Construction Schedule as submitted during bid stage, updated each week of the construction phase.
 - 9. List of proposed storage facilities and their location(s).
 - 10. Certificates as approved Applicator by Manufacturers.
 - 11. Proposed location(s) of dumpsters.
 - 12. Schedule of Values; broken down by labor and materials for each trade, and including unit price items.
 - 13. List of all suppliers, manufacturers and sub-Contractor who are to provide services and or materials for this project (to be updated with each requisition).
 - 14. Certificate of Dumping Facilities.
 - 15. Disposal Plan.
 - 16. Temporary protection plan and containment plan.
 - 17. Work sequencing and phasing plan to include garage close-down locations and duration.

- C. Weekly Submissions: At the end of each weekly period during construction, the Contractor shall submit an updated construction schedule which will show the status of the work with respect to the schedule and anticipated completion date. A list of all completed work is also required, along with phasing and garage close-down proposed locations.

- D. Prior to start of construction, the Contractor is to provide the Owner with copies of all building, fire and dumping permits, etc.
- E. Weekly Submissions: The Contractor shall submit a CD-ROM or DVD computer disk of a minimum twenty (20) representative digital photographs from similar vantage points of during construction operations. The Engineer and/or Owner reserve the right to increase/decrease the number of exposures depending on the scope of work performed at any given time during construction. The intent of the photos is to depict before, during and after renovation photos and site logistics.

1.4 SHOP DRAWINGS

- A. Original Submittal: Three (3) prints of all shop drawings shall be submitted for approval within ten (10) days of Award of Contract.
- B. Shop drawings for all aspects of this project shall be submitted. The shop drawings shall include existing conditions, all applicable dimensions, new products to be installed, locations, etc.
- C. Resubmittal: When a resubmittal is required, the original transparency so indicating will be returned to the Contractor. After revision of the original, one (1) new reproducible and one (1) print shall be submitted for review.
- D. Review: The above procedure shall be repeated until approval is obtained. One (1) copy of the reviewed shop drawing will be returned to the Contractor, one (1) copy will be sent to the owner, and one (1) copy will be retained by the Engineer for record.
- E. Shop drawings of an engineering nature shall be sent directly to the Engineer for review, with a copy of the transmittal and one (1) print sent to the Owner.
- F. Transmittal: All re-producible shall be transmitted rolled in mailing tubes and not folded.

1.5 RECORD DRAWINGS

- A. The Contractor shall provide a copy of all Contract Drawings showing as-built conditions and any Contract changes to the Owner at the completion of the project.

1.6 PHOTOGRAPHS

- A. The Contractor shall submit periodic photographs documenting the before, during and after construction work throughout the project, in JPG format as described in the Weekly Submissions paragraph previously described in this section. Project photographs for the entire project will be submitted to the Engineer and Owner at the end of the project as part of the final close-out documents.

1.7 SAMPLES

- A. Original Submittal: Four (4) samples, unless otherwise specified, of each item for which samples are required shall be furnished for approval. Approval shall be obtained prior to ordering and delivery of the materials to the project site. Such samples shall be representative of the actual material proposed for use in the project and of sufficient size to demonstrate design, color, texture and finish when these attributes will be exposed to view in the finished work.
- B. Resubmittal: All rejected samples will be returned upon request, and any or all resubmittals shall consist of four (4) new samples.
- C. Review: Upon approval by the Engineer, one sample so noted will be returned and the remainder will be retained by the Engineer until completion of the work. When requested, all approved samples will be returned for installation, provided their identity is maintained in an approved manner until final acceptance of the project.
- D. Important specific samples are specified in Technical Sections of the Specifications. The Contractor is cautioned to quickly provide specified samples.
- E. Each submittal item shall have the technical section and paragraph number clearly indicated. All submittal items without the proper designations will be returned and will not be reviewed.

1.8 CATALOG DATA

- A. Submittals: Four (4) copies of catalog data are required for the original submittal and each subsequent resubmittal along with shop drawings. Following review, one (1) copy will be returned with its status noted. If approved, such additional copies may be requested by the Engineer and shall be furnished without additional costs.
- B. Data: Each submittal shall have all pertinent data contained therein that is applicable to the item submitted for review, adequately and permanently designated.

1.9 MANUFACTURER'S INSTRUCTIONS

- A. Where in these Specifications an item is called for to be installed in accordance with the manufacturer's directions, requirements, specifications or recommendations, the Contractor shall furnish the Engineer with two (2) printed copies of said directions, requirements, specifications or recommendations, before the item is installed.

1.10 CERTIFICATES AND GUARANTEES

- A. Certificates of performance, treatment and conformance to specified standards shall be submitted prior to initiating work on the project.
- B. Copies of all guarantees required on the project shall be submitted for review and acceptance as to form.

1.11 IDENTIFICATION

- A. Data: All submittals for review shall have the following identification data, as applicable, contained thereon or permanently adhered thereto:
1. Project name and location.
 2. Engineer's name.
 3. Subcontractor's, Vendor's and/or Manufacturer's name and address.
 4. Product Identification. (It is important that the specific product intended for use is indicated on manufacturer's literature).
 5. Shop drawing title, drawing number, revision number and date of drawing and revision.
 6. Applicable Contract Drawings and Specification Section numbers.
- B. Catalog Data: Each separate catalog, brochure or single page submitted shall have the identification required hereinbefore.
1. Catalogs or brochures submitted containing multiple items for approval need the identification on the exterior and on each specific item clearly circled, flagged or otherwise identified.
 2. In the event that one or more of the multiple items are not approved in any submittal, the additional copies required will not be requested until all items are approved.
- C. Space: Vacant space approximately three and one-half inches high by five inches wide shall be provided adjacent to the identification data to receive the Engineer's status stamp.

1.12 CONTRACTOR'S RESPONSIBILITY

- A. Representation: By his submittal of any shop drawing or catalog data, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, or will do so, and that he has checked and coordinated each item with other applicable approved shop drawings and the Contract requirements. Certification shall appear on each shop drawing stating that the Contractor has made this check. All drawings without this certification will be returned without examination.
- B. Deviations: Changes on the submitted shop drawings that deviate from the Design Drawings must be brought to the Owners and Designers attention in writing prior to review. Changes must be clearly visible on the shop drawings in the form of written notation, ballooning or highlighting the intended change. A written description for the proposed change must also be included and submitted on company letterhead. Changes to drawings and details not submitted in accordance with these requirements will not be recognized as an approved deviation from the Design of Record. Construction repairs, renovations or replacements required as a result of shop drawing and submittal deviations that are not documented in accordance with these requirements are subject to removal and/or replacement by the Contractor, at the sole cost of the Contractor.

- C. Prohibitions: No portion of the work requiring a shop drawing, sample or catalog data shall be started, nor shall any materials be fabricated or installed, prior to the approval of such item.
- D. Review: Project work, materials, fabrication and installation shall conform with approved shop drawings, applicable samples and catalog data.
- E. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Designer's receipt of submittal.
 - 1. Initial Review: Allow **15** calendar days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will advise the Contractor when a submittal being processed must be delayed for coordination.
 - 2. Concurrent Review: Where concurrent review of submittals by the Engineer's consultants, or other parties is required, allow **15** calendar days for initial review of each submittal.
 - 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Engineer's consultants, provide duplicate copy of the transmittal to the Engineer. The submittal will be returned to Engineer before being returned to Contractor.
 - 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 5. Allow **15** calendar days for processing each re-submittal.
 - 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 30 00 - Shop Drawings and Submittals.docx

TEMPORARY FACILITIES

SECTION 01 50 00

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 DESCRIPTION

- A. This Section contains instructions and requirements for the provision and utilization of temporary facilities to protect the Owner's property, the site and construction materials; and daily maintenance and cleanup of the site during the project.

1.3 CONTRACTORS USE OF EXISTING FACILITIES

- A. The parking facilities will be occupied and in use during construction. The Contractor shall provide all protection, guards and barriers necessary to segregate the work area and adjacent or below areas from pedestrian and vehicular traffic. Protect existing building, building finishes, autos and vehicles, landscaping and paved areas from damage.
- B. Limit use of the premises to the work indicated, so as to allow for the Owner's uninterrupted occupancy and use. Confine operations to the areas indicated under the Contract. Conformance to the regulations set forth by the Owner, regarding use of existing facilities is mandatory.
- C. Sanitary facilities shall be provided by the Contractor. Use of the building's sanitary facilities is not permitted. Facilities shall be ballasted and secured to prevent overturning and unauthorized access. Units shall be placed in Owner approved locations.
- D. Owner will assist in controlling occupancy. Contractor shall provide and place portable barricades, as coordinated with the Owner, under work areas on lower parking decks.
- E. Take precautions necessary and provide equipment, materials and labor to adequately protect previous construction, the building, its contents and occupants, and surrounding landscaped areas from damage due to construction as well as from inclement weather during construction.
- F. Clean interior and exterior areas affected by the construction on a daily basis. Do not allow construction debris, waste materials, tools, excess packaging materials or other construction related materials to accumulate on the roof, in the facility, or at the exterior grounds and pavements.

- G. See Section 01 63 00 WEATHER PROTECTION AND MATERIALS STORAGE for product storage facilities and requirements.

1.4 UTILITIES

- A. Electrical service will be provided to the Contractor free of charge by the Owner through exterior electrical outlets if operable. Use shall be limited to construction hours. The Contractor will be required to provide their own generators as required to operate dust collection devices, hydrodemolition equipment/reclamation and/or equipment which may require large amperage than that available on site. The Owner reserves the right to charge the Contractor for excessive electrical service usage (i.e., wasteful usage). Should charges be considered, the Owner will notify the Contractor in writing of his/her intent, 48 hours in advance.
- B. Water for construction purposes will be provided to the Contractor free of charge by the Owner through exterior water spigots if operable. The Owner reserves the right to charge the Contractor for excessive or wasteful use. Should charges be considered, the Owner will notify the Contractor in writing of his/her intent, 48 hours in advance. Drinking water shall be provided by the Contractor.
- C. All other utilities (phone, fax, access to the site, sanitary facilities, etc.) required will be provided by the Contractor.
- D. Plumbing, heating, and electrical work, including reinstallation of equipment and other work to be performed by the Contractor, shall be carried out without interference to both facility's normal operations. Where work requires interruption of service, the Contractor shall make advance arrangements with the Owner for dealing with such interruption.
- E. Ensure proper and safe operation and maintenance of utility systems within the construction limits, whether these are supplied by the Owner's distribution system or otherwise, until the work is accepted by the Owner. Maintain and operate appurtenances within the construction area which serve the distribution system, subject to periodic inspection by the Owner's operating personnel. Inspection by any representative or personnel of the Owner shall not relieve the Contractor of his responsibilities in connection with operation and maintenance of these facilities and equipment.

1.5 ACCESS

- A. Provide ladders, scaffolding, staging and hoists as required to access the project area(s) in accordance with OSHA and D.L.W.D. guidelines. Should damage to the building and/or grounds occur, restore damaged areas to their original condition and clean up debris.

- B. Do not interfere with normal building operations. Coordinate activities with the Owner and building occupants. All entrances must remain open during the course of construction work.
- C. Provide access to the Owner and the Owner's Representative for the proper inspection of the installed items and existing conditions.

1.6 BARRIERS

- A. The Contractor shall install temporary fencing, warning lines, barriers and the like, as required, to segregate the construction areas from existing facilities, occupants and the public.
- B. The Contractor is required to conform to OSHA requirements and all local, state and federal safety regulations.
- C. The Contractor shall provide guard lights on all barriers and all lighting necessary to prevent vandalism of work and storage areas. The Owner is not responsible for Contractor's losses due to damage or theft by vandals.

1.7 TEMPORARY PROTECTION

- A. Provide suitable Owner approved temporary protection to prevent the entrance of debris and obstructions into the building. Provide warning signs to reroute personnel around areas of dangerous work. Schedule operations to allow for completion of work over a predetermined area within a day's work.
- B. Protect materials scheduled to be reused from damage by placing them in labeled containers or wrappings stored in a weather tight trailer.

1.8 RUBBISH

- A. The Contractor shall supply adequate covered receptacles for waste, debris and rubbish.
- B. All receptacles must be immediately removed from the site when full. Should, for any reason, receptacle removal not be possible on any given day, the Contractor shall move the receptacle away from the building to an area on site designated by the Owner. All receptacles will be tarped over at the end of each work day.
- C. The grounds in the area of the receptacle must be cleaned prior to moving the receptacle to another location on the project. Disposal shall be off-site in a legal dump intended for that use.
- D. The receptacles shall be located in areas designated by the Owner. Receptacles shall not remain adjacent to the building overnight.

1.9 VOLATILE MATERIALS

- A. The Contractor is reminded that the adhesives, solvents, etc., are highly volatile and flammable materials. These materials, along with tools and applicators and rags, shall not be stored on or within the building. Do not transport materials through the building. Take precautions and closely follow the Specification requirements for fire protection on site during construction.
- B. Locate and use flame-heated equipment so as not to endanger the structure, other materials on site, or adjacent property. Locate and use flame-heated equipment in specific areas approved by the Owner. Do not relocate flame-heated equipment without prior approval from the Owner.

1.10 FIRE PROTECTION

- A. The Contractor shall provide all necessary temporary fire protection for the building, building contents and materials during construction. The Contractor shall provide incombustible protective blankets where necessary to protect surfaces or building contents from damage.
- B. Should any cutting, burning or welding be necessary, the Contractor shall provide a fire watch. This watch will continue during the operations and for four (4) hours minimum after completion.
- C. At no time shall open flames be present around adhesives, caulks or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvents shall not be discarded in the dumpsters, but shall be stored in a metal receptacle and removed from the site daily.
- D. The Contractor shall be required to comply with all local fire codes and shall obtain all permits necessary from the local fire department and provide one (1) copy to the Engineer.
- E. The Contractor shall provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two (2) within 100 feet of the work area or as specifically required by local fire officials.

1.11 CLEAN-UP

- A. Site clean-up shall be complete and to the satisfaction of the Owner. Site clean-up shall be performed daily.
- B. All facilities (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris, and dirt caused by or associated with the work.
- C. All landscape areas damaged or littered due to the work shall be raked clean and reseeded if required.

- D. All paved areas shall be swept clean of debris daily.
- E. All areas stained, dirtied, discolored or otherwise damaged due to the work shall be cleaned, restored or replaced as required.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 50 00 - Temporary Facilities.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

WEATHER PROTECTION AND MATERIALS STORAGE

SECTION 01 63 00

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 GENERAL

- A. The Contractor shall take the necessary precautions and provide all equipment, materials and labor necessary to adequately protect the Contract Area, previous construction, the buildings, their contents and occupants, surrounding landscaped and paved areas from damage due to the construction or inclement weather during construction.
- B. The Contractor shall provide all access to the work. Staging and other access shall be provided until new work has been accepted by the Owner.

1.3 WEATHER PROTECTION

- A. Weather protection shall mean the temporary protection of that work adversely affected by moisture, wind, heat and cold by covering, patching, sealing, enclosing, ventilating, cooling and/or heating. This protection shall be provided for all work areas, the buildings and their contents, trafficked adjacent areas, and all construction materials and accessories.
- B. The cost of heat, fuel and power necessary for proper weather protection shall be the responsibility of the Contractor.
- C. Installation of weather protection shall comply with all safety regulations, including provisions for adequate ventilation and fire protection devices.
- D. In all cases, no materials shall be installed if rain or other precipitation is forecast or imminent within twenty-four (24) or less hours. Do not install any material during precipitation events, including heavy fog and mist or drizzle.

1.4 FIRE PROTECTION

- A. The Contractor shall provide all necessary temporary fire protection for the buildings, building contents and materials during construction. The Contractor shall provide incombustible protective blankets where necessary to protect surfaces or building contents from damage.

- B. At no time shall any combustibles be stored inside the building. All adhesives, caulks and cleaning solvents shall be stored well away from the building in a method approved by local fire officials.
- C. Should any cutting, burning or welding be necessary, the Contractor shall provide a fire watch. This watch will continue during the operations and for four hours minimum after completion.
- D. At no time shall open flames be present around adhesives, caulks or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvents shall not be discarded in the dumpsters, but shall be stored in a metal receptacle and removed from the site daily.
- E. The Contractor shall be required to comply with all local fire codes and shall obtain all permits necessary from the local fire department and provide one (1) copy to the Engineer.
- F. The Contractor shall provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two (2) within 100 feet of the work area or as specifically required by the Fire Department.

1.5 MATERIAL STORAGE

- A. All materials shall be stored in trailers on site or brought to the site daily. Storage trailers will be allowed in the location(s) designated by the Owner. All flammable substances cannot be stored on the property and must be brought to the site daily. Limited non-flammable material storage may be allowed with prior written approval by the Owner or Engineer.
- B. In the event that materials are exposed to the elements, they shall be marked as unacceptable and immediately removed from the site. They may not be used.
- C. The Contractor will be required to provide additional tarps or canvas covers over any materials that may be stored with the Owner's permission at the site. The Contractor will not be permitted to rely on the manufacturer's shrink wrap material as the sole source of weather protection. These covers are to be adequately ballasted and secured to prevent wind uplift.

1.6 NOTIFICATION

- A. If, during the Contract period, the Contractor is notified of insufficient weather protection, he shall, within 24 hours, properly restore the weather protection and repair or replace any damaged unprotected materials and systems.
- B. Should the Contractor not effect immediate repair or replacement when notified, the Owner shall have the proper protection installed at the Contractor's expense. The Contractor is responsible for all damages to the building as a result of leaks.

1.7 MANUFACTURER'S INFORMATION

- A. The manufacturers of all the materials shall supply written instructions concerning the storage and handling of all supplied materials, including sealants, and accessories. The manufacturer shall also provide information concerning storage and handling of flammable or volatile materials.
- B. Storage facilities shall be acceptable to the manufacturer and conform to his written requirements concerning temperature, humidity, ventilation and the like.
- C. The "shelf-life" of materials shall be provided with the date of manufacture of all perishables, including volatiles, caulking and mastics.
- D. The Contractor shall supply a copy of all manufacturers' written instructions to the Owner and Engineer as outlined in Section 01 30 00 - Shop Drawings and Submittals. The Contractor shall comply with all storage and handling requests and instructions of the manufacturer.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 63 00 - Weather Protection and Materials Storage.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

PROJECT CLOSE-OUT

SECTION 01 70 00

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 DESCRIPTION

- A. When the project is established to be substantially complete, preparations will be made to close out the project. The preparations are as described in this section.

1.3 PUNCH LIST

- A. After the project is determined to be substantially complete, the Contractor must submit a letter to signify that the project has achieved substantial completion status. A representative of the Owner will tour the project and compile a "punch list" of minor unsatisfactory conditions. A copy of this list will be sent to the Contractor and he shall then correct the unsatisfactory conditions. When all items on the list have been corrected, the Contractor shall notify the Owner's representative and a re-inspection will be made by that representative.
- B. Minor "punch list" items shall be only those items which have been installed and are functional, requiring cosmetic repair or cleaning which do not affect the integrity of the system. Any work specified within the Contract Documents which has not been performed or has been performed in a non-conforming manner to the Contract Documents shall not be defined as minor "punch list" items, and must be performed or corrected as appropriate in order to achieve substantial completion.
- C. Should additional reinspections be required due to punch list items which are reported to be complete but are not completed or improperly completed, the costs of these reinspections will be assessed and required to be paid for by the Contractor.

1.4 MANUFACTURER'S INSPECTION

- A. After the re-inspection by the Owner's representative, the material manufacturer's representative will be required to tour the site. The representative shall determine if the materials have been installed as required by the manufacturer and in accordance with the contract documents.

- B. Any items the representatives determine were not so installed shall be reinstalled so as to comply with the manufacturer's intended use. The manufacturer shall forward a copy of the list of all items determined to be not installed as intended by the manufacturer to the Engineer. Final issuance of the Contractor's payment will not be released until the manufacturer's inspection letter has been forwarded to the Engineer.
- C. Costs associated with all manufacturer inspections shall be the responsibility of the Contractor.

1.5 GUARANTEES

- A. When both the Owner's representative and the manufacturer's representative agree that the Contractor has performed according to the Specifications, and has installed the materials to the satisfaction of the manufacturer, the Contractor shall petition the manufacturer for the materials warranty. The Contractor's Guarantee shall be signed by the Contractor. He shall forward this guarantee to the Owner and provide one (1) copy for the Engineer.
- B. The Contractor will be required to provide lien releases for his work. The Contractor shall then forward his guarantee covering the construction to the Owner and provide one (1) copy for the Engineer.

1.6 RETAINAGE RELEASE

- A. When all guarantees, certifications and requested lien releases have been received, the Owner shall release to the Contractor the project retainage and any other monies retained by the Owner to guarantee project completion.

1.7 DOCUMENTS REQUIRED FROM THE CONTRACTOR PRIOR TO FINAL PAYMENT

Documents will be submitted to the Engineer in triplicate, each set in individual binders for submission to the City of Lowell. These items include, but are not limited to, the following:

- A. All applicable manufacturer's warranties.
- B. Contractor's two (2) year guarantee.
- C. Executed Punch List Inspection letter.
- D. Consent of Surety Company to Final Payment.
- E. Contractor's Affidavit of Release of Liens.
- F. Contractor's Affidavit of Payment of Debts and Claims.
- G. Final Application and Certificate for Payment.
- H. Completed waste shipment records and dumping manifests.
- I. As Built Drawings.
- J. Other documents which may be specifically required by the City of Lowell or the Engineer.
- K. Materials manufacturers field reports.
- L. Contractor's weekly digital photograph compilation.

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

I:\837920\02 Design\specs\837920 01 70 00 Project Close-Out.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

MAINTENANCE OF CAST-IN-PLACE CONCRETE

SECTION 03 01 30

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Related Work: Coordinate the work in this Section with that of the Sections listed below for the proper completion of the Project.

- A. Section 07 18 00 – Vehicular Traffic Coating
- B. Section 07 92 00 – Joint Sealants

1.3 DESCRIPTION OF WORK

In general, the Contractor shall supply all labor, equipment, staging, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Project Specifications and in accordance with good construction practice. All concrete repairs shall be completed as part of the scope of work. The work under this Section generally includes the following:

- A. Locate, mark and document wall reinforcing steel, pre-tensioned slab tendons and other structural embedded items within repair locations where drilling or cutting is required.
- B. Provide all lifts, staging and temporary tie-off as required to complete the work.
- C. Provide all necessary surface preparation, climate control, curing and temporary protection.
- D. Repair concrete cracks and spalls where designated on the Contract Drawings. Additional repairs approved by the Owner will be compensated on a Unit Price basis. Refer to Section 01 22 00 – UNIT PRICES for additional information.
- E. Remove loose and delaminated concrete at locations designated as “Delaminated Concrete” on Contract Drawings. Following removal loose concrete, perform concrete spall repairs.

- F. Clean and restore all areas affected by the work.

1.4 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. Quantities to be carried under the base bid work have been shown on the Contract Drawings. Additional quantities have been carried under each item as Unit Price scopes of work. Refer to Section 01 22 00 Unit Prices for additional information. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.5 SUBMITTALS

- A. Refer to Section 01 33 00 – SHOP DRAWINGS AND SUBMITTALS for submittal provisions and procedures.
- B. Submit technical data sheets for all products specified in Part 2 of this Section. Data sheets shall provide sufficient information to verify compliance with the specifications. Indicate intended location of use on each data sheet.
- C. Submit Safety Data Sheet (SDS) for all products specified in Part 2 of this Section.
- D. Submit associated equipment and materials list, including, but not limited to, surface preparation equipment and methods used, pinning and mesh hardware, injection apparatus, primers, bonding agents, etc.
- E. Submit means and methods proposed for curing and protecting all repairs, and for masking surrounding surfaces and protecting public from work areas, etc.

1.6 JOB CONDITIONS

- A. The facilities will be occupied during the construction. The Contractor shall provide all protection, barriers, and guards necessary to segregate his work area from pedestrian and vehicular traffic.
- B. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the facilities, fixtures and facilities affected by the Work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the facilities, occupants and the surrounding landscaped and paved areas.
- C. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied. Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture and other conditions affecting concrete repairs.

- D. Coordinate the work in this Section with the work by other trades to ensure the orderly progress of the Work.
- E. Under no circumstances shall the Contractor remove existing materials and systems in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Property areas and occupying cars shall be protected from airborne debris.
- F. The Contractor shall take all necessary precautions to avoid damaging post-tensioned slab reinforcing steel while performing both facilities repairs. The Contractor is to utilize services of a professional Ground Penetrating Radar (GPR) Inspection company and locate tendons and all concrete embedded items. In no instance shall reinforcing steel or other embedded items be drilled through, damaged, or modified in any way as a result of this project.
- G. During surface preparation operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the Work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures, personal property, or adjacent repairs. Specific attention is drawn to the use of chemicals, cleaners and pieces of demolished concrete.

1.7 TEST AREAS

- A. Before full-scale work is commenced, execute the following work for trial work areas to be reviewed by the Manufacturer's Field Representative as to surface preparation and material mixing and application acceptability.
 - 1. Two (2) shallow concrete spall repairs (minimum 1 s.f. each).
 - 2. Two (2) deep concrete spall repairs (minimum 1 s.f. each), including cleaning and coating of existing rebar (if applicable).
 - 3. Two (2) concrete crack repairs (minimum 1 l.f. each).
- B. Repairs shall conform to the Contract Documents and manufacturer's instructions and once accepted shall become a standard for all subsequent work.
- C. Trial areas shall be repeated until acceptable results are obtained, and the accepted areas shall be a standard for all subsequent work. Construction of test areas shall be in conformance with all Contract Documents and shall use only submitted materials. After curing, the test areas shall be viewed, sampled, and/or removed as directed by the Manufacturer's Field Representative to establish to his satisfaction the actual performance of the installed materials. Evidence of improper or unsatisfactory performance shall be grounds for rejection of any or all of the submitted or applied materials.

1.8 REFERENCES

- A. The Codes and Standards specified herein are based in the English (U.S. Customary) system. Substitution of SI Metric equivalents is not acceptable.
- B. "Standard Specifications for Structural Concrete" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except where more stringent requirements are shown on Contract Drawings or specified herein.
- C. Comply with provisions of following codes, specifications, and standards except where more stringent requirements are shown on Contract Drawings or specified herein:
 - 1. "Building Code Requirements for Reinforced Concrete" (ACI 318). American Concrete Institute, herein referred to as ACI 318.
 - 2. "Causes, Evaluation, and Repair of Cracks in Concrete Structures" (ACI 224, 112), American Concrete Institute.
 - 3. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.
 - 4. "Hot Weather Concreting," reported by ACI Committee 305 (ACI 305R).
 - 5. "Cold Weather Concreting" reported by ACI Committee 306 (ACI 306R).
 - 6. ICRI: International Concrete Repair Institute.
 - 7. CRSI: Concrete Reinforcing Steel Institute.
 - 8. SSPC: Steel Structures Painting Council (The Society for Protective Coatings).
 - 9. AASHTO: American Association of State Highway and Transportation Officials.
 - 10. ASTM: American Society of Testing and Materials.

1.9 QUALITY ASSURANCE

- A. Contractor must coordinate site visits with appropriate manufacturer's field representative to view surface preparations, material mixing, application procedures, and curing operations for each different material. Refer to Part 1.7 "TEST AREAS."

1.10 UNIT PRICES

The Contractor shall carry the units outlined in Section 01 22 00 – UNIT PRICES under their contract amount in the event that additional deteriorated concrete deck is encountered after removal of delaminated concrete. Concrete repair work shall be brought to the Owner/Engineer's attention and shall be either added or deducted based on the unit costs.

1.11 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All facilities surfaces shall be cleaned of all trash, debris and dirt caused by, or associated with, the Work.
- C. All trash and debris shall be completely removed from the Site daily during the Work and at the completion of the Work. All debris shall be legally disposed of off-site.

1.12 GUARANTEES

Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 - MATERIALS

2.1 CONCRETE REPAIR MORTAR

- A. Repair mortar for partial-depth spall repair shall be a high performance, rapid setting, non-sag, early strength gaining, low resistivity cementitious, patching material for vertical and overhead repairs such as:
 - 1. SikaRepair 223, as manufactured by Sika Corporation
 - 2. Eucocrete, as manufactured by Euclid Chemical
 - 3. Eucorepair CP (pumpable), as manufactured by Euclid Chemical

2.2 MORTAR BONDING AGENT/REINFORCING PROTECTION

- A. Bonding agent for application onto prepared spall repair substrates as well as anti-corrosion coating for cleaned steel reinforcement shall be installed per repair mortar manufacturer's written recommendations.
- B. Structural adhesive for embedded reinforcing bar dowels shall be:
 - 1. Sikadur 31 HI-MOD as manufactured by Sika Corporation
 - 2. HIT HY-200, as manufactured by Hilti
 - 3. SET-3G, as manufactured by Simpson Strong Tie

2.3 CONCRETE REINFORCEMENT

- A. Reinforcing Bars:

Where corroded steel reinforcing bars are encountered at spall locations, they shall be supplemented with additional reinforcing bars of equal size as the damaged bar. Material should be as follows:

1. Deformed billet steel: ASTM A615, Grade 60.
 2. Bend test: Meet 90° bend test at 60° F minimum temperature around a 10 bar diameter bend without cracking.
- B. Tie wire:
1. Annealed Steel – Federal Specification QQ-W-461, 16 gage minimum.
- C. Bar Supports:
1. Conform to “Bar Support Specifications”, CRSI Manual of Standard Practice, Class B – Pregalvanized cold-drawn wire.
- D. Fabrication in accordance with CRSI Manual of Standard Practice.

2.4 ROUT AND SEAL

- A. Cracks through existing concrete floor slab shall be routed and sealed. Sealant for use to fill prepared control joints and cracks shall be a solvent-free, moisture-tolerant, flexible epoxy control joint sealer and adhesive, either non-sagging or self-leveling as required such as Sikadur 51 as manufactured by Sika Corporation, Inc., or Engineer approved equal.

2.5 ACCESSORY MATERIALS

- A. Polyethylene for curing patches shall be 6-mil polyethylene plastic sheet, or Engineer approved equal.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Do not deliver to Site or install any material or system that has not been approved. Materials installed without approval may be required to be removed at no additional cost to the Owner.
- B. Comply with the manufacturer's written instructions and these Specifications for all renovations and associated work.
- C. Partial or unmarked cans or rolls of materials cannot be used.
- D. Verify that all surfaces have been demolished to the specified depth and surface profile, and thoroughly cleaned for the areas to receive repairs.

- E. Provide all devices and protection (including heaters, dehumidification, ventilation, etc.) necessary to maintain areas and surfaces at the proper temperature, humidity, and surface moisture content for the curing of repair mortar, epoxy, and other materials.
- F. No concrete repair work shall be executed when the temperature in the work areas has dropped below 50 degrees Fahrenheit, unless heated. Consult the manufacturers of the materials for proper application and storage procedures.
- G. Prior to commencing with the repair work, the Contractor is required to perform GPR (ground penetrating radar with 1.6 ghz ultra-wide band) scanning in combination with radio detection apparatus capable of 60-cycle and electrical current detection as a minimum. In no case, shall the existing reinforcing steel or any other embedded items be damaged, cut or modified as a result of the work. The Contractor may consider the services of "GPR Professional Services, Inc." of Marblehead, MA; Mr. Ben Cleary (781) 718-0725.
- H. The contractor is cautioned to investigate all existing conditions of the post-tensioned garage slab. All replacement items, including but not limited to clamps and strainers must be completely compatible and match the existing system.
- I. Clean all new drain assemblies thoroughly of dust, dirt, debris, and sealant materials.

3.2 CONCRETE SPALL REPAIRS

- A. Remove areas of spalled, delaminating, cracked, loose or otherwise unsuitable concrete from the garage floor slab surface. Define all repair areas with 1/4" deep saw cut. Undercut or "key" in spall repair edges on at least two (2) opposite sides to mechanically retain the repair. Cuts shall not overlap at corners.
- B. Using hand and electric power tools (15 lb. Maximum chipping hammers) remove all areas of deteriorated, delaminating, de-bonded, spalled or otherwise damaged concrete from existing surfaces, as required to install the new work. Sound concrete areas adjacent to cracks to determine additional spall areas. Removal of deteriorated concrete and surface preparation shall be completed as recommended by the patching mortar manufacturer and as outlined within these specifications.
- C. Prepare the surface of the existing concrete to receive the repair mortar and/or bonding agent. Provide a 1/8" minimum aggressive surface profile with fractured aggregate (ICRI-CSP 8 or CSP 9). Tool marks should be visible. Examine substrate for cracks and treat with specified crack repair procedure.
- D. Completely remove all dust, grease, and other impurities via high-pressure water wash, combined with wire brushes, chipping, grinding, or other methods as required to achieve acceptable bonding surfaces. Dampen the existing surface area with clean potable water, to obtain saturated-surface-dry (SSD) conditions.

- E. Apply coating/bonding agent to all substrate surfaces and reinforcing steel as recommended by the repair mortar manufacturer. Provide one (1) coat on concrete substrates and two (2) coats on all steel items. Slurry scrub repair mortar into prepared damp substrates.
- F. Install repair mortar to properly prepared areas within a time period to achieve a "wet-on-wet" mortar application. Mix repair mortar in accordance with the material manufacturer's instructions. Utilize the manufacturer's recommended mix rates.
- G. Finish the repairs flush with the existing surfaces. Insure that the surface, texture, and profile is roughed and textured match surrounding concrete and to achieve proper mechanical bond with the later applied coating primer. Do not feather edge repairs, but install in 1/4" minimum applications, or as otherwise limited by each materials manufacturer's limitations.
- H. Clean uncured materials off of undesired areas with a moist sponge or cloth immediately after application.
- I. Provide for proper cure of patch as recommended by the repair material manufacturer. At a minimum, curing shall consist of continuous polyethylene sheet, duct taped to the adjacent surfaces. Curing materials shall remain in place for the minimum manufacturer's specified time based upon surface and ambient temperatures and humidity.

3.3 CRACK REPAIRS VIA ROUT AND SEAL

- A. Rout or "vee" crack by saw cutting to a minimum width of 1/4" and minimum depth of 1/2".
- B. Clean the routed crack and adjacent area of all loose material with high pressure air to blow the crack clean.
- C. Coordinate placement of sealant in routed concrete cracks. Refer to Section 079200 – Joint Sealants for placement requirements.

3.4 CLEAN-UP

- A. Prior to acceptance of the repair work covered in this section, the Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

I:\837920\02 Design\specs\03 01 30 - Maintenance of CIP Concrete.docx

CAST-IN-PLACE CONCRETE

SECTION 03 30 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

This Section is just one portion of the Contract Documents. All Contract Documents, including General and Supplementary Conditions, Drawings, Divisions 01 to 32 Specification Sections apply and are made part of this Specification Section.

1.2 RELATED REQUIREMENTS

- A. Section 03 01 30 – Maintenance of Cast-in-Place Concrete

1.3 SCOPE OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this section, as required in the specifications and in accordance with good construction practice. The work under this Section includes cast-in-place concrete as shown on the contract documents.
- B. Clean all areas affected by the work to the satisfaction of the Owner.

1.4 JOB CONDITIONS

- A. The Contractor shall provide all protection, barriers, and guards necessary to segregate this work area and the areas below, from pedestrian and vehicular traffic. Also protect existing buildings, landscaping and paved areas from damage.
- B. The Contractor shall be responsible for securing and protecting his/her equipment, materials and tools (as well as partially completed construction) from wind blow-off and vandalism or abuse.
- C. Environmental Requirements: Do not place concrete during rain, sleet or snow unless adequate protection is provided, and the Engineer's approval is obtained. Do not allow rainwater to increase the mixing water or damage the surface finish.
- D. Cold Weather Concreting:
1. Conform to ACI 306 latest edition, "Recommended Practice for Cold Weather Concreting."
 2. Temperature of concrete when placed shall not be less than the following:

Minimum Concrete Temperature °F
Sections with Least Dimension

| Air Temp (°F) | Under 12" | 12" and Over |
|---------------|-----------|--------------|
| 30 to 45 | 60 | 50 |
| 0 to 30 | 65 | 55 |
| Below 0 | 70 | 60 |

3. When placed, heated concrete shall not be warmer than 80° F.
4. Prior to placing concrete, all ice, snow, and surface and subsurface frost shall be removed, and the temperature of the surfaces to be in contact with the new concrete shall be raised to the temperature specified above for placing.
5. Protect the concrete from freezing for four (4) days after placement.
6. Heated enclosures shall be strong and windproof to ensure adequate protection of corners, edges and thin sections. Do not permit heating units to locally heat or dry the concrete. Do not use combustion heaters during the first 24 hours unless the concrete is protected from exposure to exhaust gases which contain carbon dioxide.
7. When air temperature gets below 25 degrees F, two (2) additional ASTM C39 cylinders shall be made and located at the site in a location and under conditions which will match the placement that they represent. After seven (7) days of site conditions, the cylinders shall be placed in a steam room for twenty-one (21) days.

E. Hot Weather Concreting:

1. Conform to ACI 305 latest edition, "Recommended Practice for Hot Weather Concreting." Take precautions when the ambient air temperature is 90° or above. Temperature of the concrete when placed shall not exceed 80° F. Cool forms and reinforcing to a maximum of 90° F by spraying with water prior to placing concrete. Do not use cement that has reached temperatures in excess of 170° F.

F. Prevent plastic shrinkage cracking due to rapid evaporation of moisture. Do not place concrete when the evaporation rate (actual or anticipated) equals or exceeds 0.20 pounds per square foot per hour, as determined by Figure 2.1.4 of ACI 305.

1. Set-retarding admixtures may be used with Engineer's approval when the ambient air temperature is 90° F or above to off-set the accelerating effects of high temperatures.

1.5 REFERENCE STANDARDS

- A. Reference Standards: Except as modified or supplemented herein, all concrete materials, placing, furnishing, curing and all other appurtenant work shall meet the requirements of the latest edition of the following Standard Specifications. Pertinent portions of the reference standards are included herein. Refer to the standards for detailed requirements.
 - 1. AMERICAN CONCRETE INSTITUTE STANDARDS (ACI)
 - a. 301 - Standard Specifications for Structural Concrete for Buildings.
 - b. 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - c. 316 - Building Code Requirements for Reinforced Concrete
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ATMS C109 "Test Method for Compressive Strength of Hydraulic Cement Mortars"

1.6 SUBMITTALS

- A. Refer to Section 01 3302 – Submittals Requirements. Supplement with the following:
- B. Test Reports: Perform and submit test reports for the following products in accordance with above general reference standards and specific standards set forth hereafter.
- C. Proposed Mix Design:
 - 1. Prior to commencing concrete work submit and obtain Engineer's approval of certified test report describing proposed concrete mix design, including:
 - a. Fine Aggregates - Source, type, gradation, deleterious substances and saturated surface dry specific gravity (ASTM C128).
 - b. Coarse Aggregates - Source, type, gradation, deleterious substances and saturated surface dry specific gravity (ASTM C127); soundness (ASTM C88).
 - c. Ratio of fine to total aggregates.
 - d. Weight (surface dry) of each aggregate per cubic yard.
 - e. Total water content (gallons) per cubic yard, water/cementitious materials ratio and proposed source.
 - f. Slump on which design is based, ASTM C143.
 - g. Brand, type and quantity of cement.
 - h. 7-day and 28-day compressive strength results from each of two sets of test cylinders for each proposed mix.
 - i. Air Content, ASTM C231 or ASTM C173.
 - j. Certifications of Chloride Content of admixtures.
 - k. Water soluble chloride ion content of concrete, ASTM G1218.

- I. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
- D. Cylinder Compression Test Reports:
 - 1. Submit two copies of certified test reports to Engineer indicating results of tests required in Part 3 hereof.
- E. Ready-Mix Delivery Tickets:
 - 1. Submit one copy to the Engineer of ready-mix delivery ticket for each load delivered.
 - 2. Include identification and quantity of concrete supplied.
 - 3. Include time loaded and time unloaded.
 - 4. Reading of revolution counter at times initial water added, supplemental water added, and unloading completed.
 - 5. Amounts of initial and supplemental water added, and name of individual authorizing supplementing water.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. Independent Testing Lab: Concrete used for all foundations (slabs, walls, footings, etc.) shall be tested by an independent ACI certified testing lab, hired and paid for by the Owner. The Contractor shall contact and coordinate the testing lab services.
- E. Contractor shall notify the Engineer with a minimum of 48 hours advance for field inspection of completed reinforcing steel installation.
- F. Contractor must submit all means and methods for temporary heating of the structure during fall/winter months and when surface and ambient temperatures are not in accordance with ACI specifications.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store cement in watertight enclosures and protect against dampness, contamination and warehouse set.

- B. Stockpile aggregates to prevent segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stockpile.
- C. Store admixtures to prevent contamination, evaporation or damage. Protect liquid admixtures from freezing or harmful temperature ranges. Agitate emulsions prior to use.
- D. Store rubber and plastic materials in a cool place away from direct sunlight.

1.9 INSPECTION AND TESTING

- A. The Contractor agrees to accept as final the results of tests, inspection and reports as may be made by the testing laboratory.
- B. Inspection
 - 1. During the progress of the work, the General Contractor shall provide free and safe access to the work at all times to the Engineer and the Owner's representative. He/she shall cooperate with the Engineer to obtain proper inspection of all work and shall furnish any required samples of concrete for testing.
- C. Laboratory Inspection and Testing
 - 1. During the progress of the work, a testing laboratory paid for by the Owner, contacted and coordinated by the Contractor, and approved by the Engineer, shall conduct necessary field tests and make compensation for any variation in water content of the aggregate; and shall further direct that all batches shall be as nearly uniform as possible by the use of selected materials which are accurately measured, thoroughly mixed, and maintained at a constant water-cement ratio and consistency.
 - 2. Provide the Owner and Engineer with necessary reports covering all of the above.
 - 3. The payment for laboratory inspection and testing will be the responsibility of the Owner.
 - 4. Coordination and scheduling of tests by the testing lab shall be the responsibility of the Contractor.
 - 5. Testing required because of changes requested by the Owner in materials, sources of materials, or mix proportions; and extra testing of concrete or materials because of failure to meet the Specification requirements are to be paid for by the Owner.
- D. Required Testing During Construction:

The following minimum testing shall be performed, and field/ lab- results submitted to the structural Engineer for approval:

1. Air entrainment at placement – ASTM C231
2. Slump – ASTM C143
3. Compressive strength – ASTM C39

Concrete cylinder samples shall be obtained from each concrete delivery truck for compressive strength testing. Five (5) cylinders shall be made from each sample. Each cylinder shall be standard 6" diameter by 12" tall. One (1) cylinder will be tested at 7-day cure, and three (3) cylinders will be tested at 28-day cure to determine compressive strength of the concrete in accordance with ASTM C39. Air entrainment and slump will be tested at each sample as well. Retain the fifth cylinder sample for potential 56-day compressive testing and/ or petrographic examination. Test results which are determined by the Engineer to be deficient or questionable will require that the contractor pay for additional testing and coring of the in-place concrete, including petrographic examination with report as direct by the Engineer. Concrete determined by the Engineer to remain deficient after final testing shall be entirely removed and replaced at no additional cost.

1.10 FORMWORK DESIGN

- A. Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures and stresses.
- B. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.
- C. Forms shall be capable of withstanding the pressures resulting from the placement and vibration of concrete, in addition to applicable and anticipated construction loads.

1.11 GUARANTEES

Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of three (3) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Thickness: 3 inches ± concrete topping.
- B. Portland Cement: ASTM C 150, Type I or II.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source. Maximum aggregate size = $\frac{3}{4}$ " at slabs.

- D. Water: ASTM C 1602.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Corrosion Inhibitor: ASTM C 1582
- G. Water-Reducing Admixture: ASTM C 494, Type A.
- H. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- I. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- J. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.2 CONCRETE PRODUCTION

- A. Concrete Mixes, General - Prepare design mixes, proportioned according to ACI 211.1 and ACI 301-05. Refer to the Contract Drawings for additional information.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116 and furnish batch ticket information.
- C. Concrete shall have a minimum compressive strength of 4000 psi for slabs and walls at 28 days with a slump of no more than 4" and air entrainment of 6%.
- D. Proportioning: Proportion ingredients to produce a well-graded mix of high density and maximum workability consistent with approved mix design and subject to the characteristics as specified in the Contract Drawings.
- E. Mixing:
 - 1. Central Mixed Concrete - 1 minute for mixer capacities one cubic yard or less plus 15 seconds for each cubic yard or fraction thereof of additional capacity.
 - 2. Truck Mixed Concrete - 100 revolutions after the introduction of all ingredients.
- F. Tempering and Control of Mixing Water:
 - 1. Mix concrete only in quantities for immediate use. Do not use concrete which has stiffened due to initial set or concrete which cannot be discharged within 1-1/2 hours or 300 revolutions of the mixer drum after the introduction of the mixing water.
 - 2. Water may be added to concrete arriving at the site, only if neither the maximum slump nor the maximum water cement ratio is exceeded. Provide additional cement if required by the addition of water to maintain water cement ratio within specified limits. Obtain Engineer's approval prior to adding water or cement.

3. Incorporate any added water or cement by additional mixing equal to half the total mixing required.

2.3 CURING MATERIALS

- A. Impervious-sheet materials shall conform to ASTM C 171, type optional, except that polyethylene sheet shall not be used.
- B. Burlap and cotton mat used for curing shall conform to AASHTO M 182, Class 2.
- C. Topically applied and admix curing compounds and/or agents are not allowed due to project required epoxy floor coating and concrete densifier.

2.4 WATER

- A. Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of ASTM C94.

2.5 REINFORCING MATERIALS

- A. Welded Wire Fabric:
 1. Wire mesh - WWF 6x6-W2.9xW2.9.
- B. Reinforcing Bars; Ties and Stirrups:
 1. Deformed billet steel: ASTM A615, Grade 60.
 2. Bend test: Meet 90° bend test at 60°F minimum temperature, around a 10 bar diameter bend, without cracking.

2.6 NON-SHRINK GROUT

- A. Non-shrink grout shall be non-metallic and must conform to ASTM C 1107 (Grade C), shall have a compressive strength of 5800 psi at 28 days. Grout must be non-chloride.

2.7 JOINT MATERIALS

- A. Concrete slab control joint sealant shall be a multi-component, non-sagging, solvent free, moisture-tolerant, flexible epoxy control joint sealer and adhesive conforming to ACI 302.1R (4.10-Joint Materials).

2.8 COATING

- A. Concrete slab coating – Sikagard® SN-40 or an engineer approved equal

2.9 WATERSTOPS

- A. Hydrophilic waterstops for construction joints shall be Greenstreak CJ-0725-3K as manufactured by Sika Corporation, or approved equal.
- B. Provide manufacturer's approved contact adhesive compatible with chloroprene rubber for adhering waterstops to smooth, dry concrete surface
- C. Provide Greenstreak Leakmaster single component hydrophilic sealant as manufactured by Sika Corporation to secure waterstops to rough dry concrete.

PART 3 - EXECUTION

3.1 PREPARATION FOR PLACING

- A. Before commencing concrete placement, the following shall be performed:
- B. Demolition:
 - 1. Remove all brick pavers in the area of new concrete slab.
- C. Surface Preparation:
 - 1. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water.
 - 2. Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. The foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.
- D. Equipment:
 - 1. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material.
 - 2. Equipment for consolidating concrete shall be at the placing site and in proper working order.
 - 3. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition, and in sufficient amount for the entire placement.
- E. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage, cracking, or other damaging drying of the concrete.

3.2 FORMWORK INSTALLATION

- A. Forms shall be mortar tight, properly aligned, and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.
- B. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar.
- C. Forms shall not be reused if there is any evidence of surface wear and tear, or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse.
- D. Formwork shall not be placed in a location or manner which would cause interference with or impede the performance of reinforcing, embedded items or water stops.

3.3 COATING

- A. Forms:
 - 1. Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions.
 - 2. Forms for Class C and D finished surfaces may be wet with water, in lieu of coating immediately, before placing concrete; except that in cold weather with probable freezing temperatures, coating shall be mandatory.
 - 3. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be completely removed before placing concrete. Insofar as practical, form release agents shall be applied to form surfaces prior to placing the forms into position.

3.4 CONCRETE INSTALLATION

- A. Conveying:
 - 1. Convey concrete from mixer to final position as rapidly as practical without segregation or loss of material.
 - 2. Use only metal or metal lined chutes with maximum length of 20 feet, maximum slope 1 vertical to 2 horizontal and minimum slope 1 vertical to 3 horizontal.
 - 3. Provide a hopper at the end of long belt conveyors and chutes not meeting the above requirements.

4. Conveying by pumping methods shall conform to ACI 304. Maximum loss of slump, 2 inches. Do not use pipe made of aluminum or aluminum alloy to convey concrete. Should pumping be required for this project, all costs for pumping shall be borne by the Contractor. No additional compensation will be considered for any pumping costs.
- B. Depositing:
1. Deposit concrete in a continuous operation until the section is completed. Regulate rate of placement so concrete remains plastic and flows into position.
 2. Maximum height of concrete free fall is 4 feet.
 3. All concrete shall be placed within 1.5 hours of batching. All concrete on site more than 1.5 hours from batching time shall be rejected and sent back to the plant.
- C. Consolidation:
1. Use mechanical vibrating, rodding or spading for consolidation. Conform to ACI 309-72, "Recommended Practice For Consolidation of Concrete."
 2. Do not use vibrators to transport concrete in forms.
 3. Minimum vibrator speed 8000 rpm.
 4. Vertically invert vibrators at points 18 inches apart to a depth sufficient to penetrate 6 inches into the preceding layer. Vibrate each location for a length of time to obtain adequate consolidation (generally 5 to 15 seconds).
- D. Embedments:
1. Accurately position and securely fasten all welded wire fabric to be embedded in the concrete.
 2. Embedments shall be clean when installed. Remove concrete spatter from all surfaces not in contact with concrete.
- E. Wash-out:
1. The Contractor shall remove residue from concrete mixing wash-out from all landscape, walkways, curbs, driveways, and similar surfaces to the satisfaction of the Owner.

3.5 CURING

- A. Normal Conditions

1. All concrete shall be prevented from drying for at least the first 7 days after placing. All slabs shall be cured by spraying on the specified curing compound as per the manufacturer's printed instructions. Concrete walls shall be cured as carefully as the slabs. However, instead of covering the sides with the curing compound, it would be satisfactory if the forms were "loosened after the concrete had hardened" and the wall sprinkled with water frequently for at least five (5) days allowing the water to flow down the sides between the forms and the concrete. After the five-day wetting the forms may be removed. Curing compounds which discolor the concrete are not permitted.
- B. Cold Weather Conditions
 1. Whenever the temperature of the surrounding air is below 40 degrees F, all concrete shall be maintained at a temperature of not less than 50 degrees F for at least 72 hours and shall be protected from freezing for at least another 72 hours, or for as much time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with the curing shall
 2. remain in place and intact for at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing. The approved practices for Winter Concreting are those outlined in ACI 306.
- C. Alternates
 1. Methods of curing other than those specified above shall be approved by the Engineer before being used.

3.6 FINISHING CONCRETE

- A. Defective Concrete:
 1. Any concrete which is not formed as shown on the plans or for any reason is out of alignment or level, or shows a defective surface, shall be corrected or replaced as directed by the Engineer.
 2. Repair all surface defects and tie holes immediately after form removal.
 3. Remove honeycombed or otherwise defective concrete to sound concrete with square cut edges to avoid feathering.
- B. Patching:

1. Immediately after removing the forms, all concrete surfaces shall be inspected and any poor joints, voids, stone pockets or other defective areas and all tie holes shall at once be patched before the concrete is thoroughly dry. The patching shall be done in such a manner that it shall form a homogeneous part, in appearance, and action of the main concrete. Fins shall be removed and patched as required where concrete is exposed.
- C. Exposed Concrete:
 1. All exposed concrete finish shall be as produced through the use of new smooth plywood or metal forms.
- D. Rubbing:
 1. Smooth rubbed finish shall be provided for exposed surfaces including walls and spandrels.
 2. Smooth rubbed finish shall be produced on green concrete. All necessary patching shall be done immediately after forms have been removed and rubbing shall be completed not later than the following day. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until a uniform color and texture is produced. No cement grout or slush shall be used other than the cement paste drawn from the green concrete itself by the rubbing process.
- E. Finishing Slabs: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces.
- F. Float Finish: Apply float finish, defined in ACI 301, to surfaces indicated, to surfaces to receive trowel finish.
- G. Trowel Finish: Apply a trowel finish to surfaces indicated and to surfaces exposed to view.
- H. After apply float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
- I. Finish and measure surface so gap at any point between concrete surface and an unlevelled free-standing 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following: 1/8 inch.
- J. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

3.7 FIELD QUALITY CONTROL

- A. Concrete Tests: Conduct the following minimum tests in accordance with the requirements of ACI 301, Section 16.3.
 - 1. Strength Test:
 - a. Mold and cure five (5) cylinders from each sample. Test one at 7 days for information and three (3) at 28 days for acceptance. Retain one (1) cylinder for potential 56-day compressive testing and/ or petrographic examination.
 - 2. Slump Test: Conduct test for each strength test sample and whenever consistency of concrete appears to vary.
 - 3. Air Content: Conduct test from one of first three batches mixed each day and for each strength test sample.
- B. Acceptance of Concrete:
 - 1. The strength level of concrete will be considered satisfactory so long as the average of all sets of three consecutive strength test results equals or exceeds the specified 28-day strength and no individual strength test result falls below the specified strength by more than 200 psi.
 - 2. Upon failure of test cylinder results, the Owner may require the Contractor, at his/her expense, to obtain and test at least three 2-inch diameter core samples from the area in question. Conform to ASTM C42. Concrete will be considered adequate if the average of the three cores is at least 85% of, and if no single core is less than 75% of the specified 28-day strength.
 - 3. Upon failure of core test results, the Owner may require the Contractor, at his/her expense, to perform load tests as specified in ACI 318, Chapter 20. Should load tests fail to prove the concrete has reached the required strength; the Contractor shall remove and replace all defective concrete at no additional cost to the Owner. No contract extension will be considered for the time required to remove and replace defective concrete.
 - 4. Fill all core holes as specified for repairing defective concrete.

3.8 REMOVAL OF FORMS

- A. Removal: In general, removal of formwork shall be as specified in Section 2.7.2.3 of ACI 347 with the following exceptions:
 - 1. Use all means necessary to protect workers, passersby, the installed work and materials of other trades, and the complete safety of the structure.
 - 2. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.

3. Flush all holes resulting from the use of spreader rods and sleeve nuts, using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by means of a grouting gun; grout shall be one part Portland Cement to 2-1/2 parts sand; apply grout immediately after removing forms.
4. Forms shall not be removed until the concrete has attained sufficient strength to support its own weight together with construction live loads.
5. Forms for the vertical faces of walls may be removed 24 hours days after placement of concrete, provided the concrete is sufficiently hard and will not be damaged by the form removal operations and provided that curing and cold weather protection and other protection operations are maintained.
6. No superimposed load other than elements cast into the concrete shall be allowed on a structure until it has gained the specified 28-day compressive strength.

3.9 WATERSTOPS INSTALLATION

- A. General: Waterstops shall be installed at the locations shown on the Contract Drawings to form a continuous fluid-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified, trained personnel using approved equipment and procedures.
- B. Installation for Cast-In-Place Concrete:
 1. Clean concrete joint after first pour to remove debris and dirt.
 2. Uncoil waterstop 24 hours prior to installation for ease of handling and fabrication.
 3. Position waterstop to ensure proper distance from steel reinforcing bars to prevent rock pockets and honeycomb. Allow clearance between waterstop and reinforcing steel of a minimum two times the largest aggregate size. Prevent rock pockets and air voids caused by aggregate bridging.
 4. Cut coil ends square (or at proper angle for mitered corners) with shears or sharp blade to fit splices together without overlaps.
 5. Splices shall be sealed using cyanoacrylate adhesive (super glue) and hold the position of the splice for not less than 30 seconds. Apply a bead of sealant at all edges of the splice.
 6. Use manufacturer's recommended adhesive for bonding waterstops to concrete surface.
 7. Any exposed waterstop cells shall be sealed watertight.
 8. Follow approved manufacturer's recommendations.

9. Carefully place concrete without displacing waterstop from proper position.
10. Thoroughly and systematically vibrate concrete in the vicinity of the joint, and to maximize intimate contact between concrete and waterstop.
11. After first pour, clean unembedded waterstop leg to ensure full contact of second concrete pour. Remove laitance, spillage, form oil, and dirt.

END OF SECTION

MASONRY FILED SUB-BID REQUIREMENTS

SECTION 04 20 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section.
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents.
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications.

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Masonry Work" include all of the following listed Specification Sections in their entirety.

SECTION 01 22 00 – UNIT PRICES

SECTION 04 50 00 - MASONRY

- D. The Work of this section is shown on Drawings

A201, A202, A203, A204, A205, A206, A207, A208, A209, A210, A211, A212, A213, A214, A503, A701, A801, S113
- E. SUB-SUBS
 - 1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\837920 04 20 00 Masonry (Filed Sub-Bid).docx

MASONRY

SECTION 04 50 00

(Filed Sub-Bid with Section 04 20 00)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all sections within Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 06 10 00 – Rough Carpentry
- B. Section 07 53 00 – Elastomeric Roofing and Flashing
- C. Section 07 62 00 – Sheet Metal Flashing and Trim

1.3 SCOPE OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice and as required by the material manufacturer, as amended. The work under this Section generally includes the following:
 - 1. Remove and replace damaged, cracked, or spalled brick masonry units at locations indicated in the Contract Drawings.
 - 2. Cut and repoint masonry mortar joints at locations and as indicated in the Contract Documents.
 - 3. Rebuild locations of displaced/bulging masonry at locations as indicated on the Contract Drawings.
 - 4. Carefully remove existing brick masonry as required to install new throughwall flashings at locations as indicated in the Contract Drawings. Install new throughwall flashings and rebuild associated masonry. Existing brick masonry units that are removed for new throughwall flashing and found to be in good condition are to be salvaged for reuse.
 - 5. Remove and replace locations of failed sealant at locations as indicated on the Contract Drawings.
 - 6. Remove abandoned anchors/fasteners and infill with new brick or mortar at locations as indicated on the Contract Drawings.
 - 7. Clean brick masonry walls 100%.
 - 8. Clean all surfaces at work locations and adjacent to where masonry renovations are performed.

1.4 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. Quantities to be carried under the base bid work have been shown on the Contract Drawings. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.5 JOB CONDITIONS

- A. The Contractor shall utilize skilled and experience specialty workers having a minimum of five (5) years' experience in masonry renovation to perform the work. Experienced trade workers shall be utilized for all aspects of the masonry work.
- B. Do not leave partially completed sections exposed to the elements overnight. Provide all devices necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.
- C. To prevent staining of adjacent construction during the work, immediately remove mortar or coating which comes into contact with exterior surfaces. Protect all building components from damage or staining during construction.
- D. Prepare, install, and cure all materials in accordance with these Specifications, the Brick Industry Association (B.I.A.) Technical Notes, and the Manufacturer's Printed Instructions. In the case of a discrepancy, the Specifications will prevail.
- E. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants, and the surrounding landscaped and paved areas.
- F. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work. No brick masonry work shall be installed until it has been reviewed and approved by the Architect/Engineer for acceptability and by the Owner for acceptability as to appearance, color, and texture match.
- G. Repoint mortar joints and repair masonry only when air temperature is between 40°F and 90°F (4°C and 32°C) and is predicted remain so for at least 7 days after completion of work.
- H. Cold Weather Application – (Applies to rebuilding, no repointing shall be completed when air temperature is less than 40°F) The Contractor shall comply with the following cold weather masonry construction requirements at no change in contract price:

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

1. The cold weather construction and protection requirements shall be closely followed.
2. Construction materials shall be received, stored, and protected in ways that prevent water from entering the materials.
3. If climatic conditions warrant, temperatures of construction materials should be measured. Frozen sand and wet masonry units must be thawed. Masonry units below 20°F must be heated above 20°F without overheating.
4. Sufficient mortar ingredients should be heated to produce mortar temperatures between 40°F and 120°F. Every effort should be made to produce consecutive batches of mortar with the same temperatures falling within this range. The mortar temperature after mixing and before use should be above 40°F, maintainable either by auxiliary heaters under the mortarboard or by more frequent mixing of mortar batches. Heated mortar on mortarboards should not become excessively hot (greater than 120°F).
5. At the end of the day, the top surface of all masonry should be protected to prevent moisture, as rain, snow, or sleet, from entering the masonry. This protection must cover the top surface and should extend a minimum of 2 feet down all sides of the masonry.

| <u>WORK DAY TEMPERATURE</u> | <u>CONSTRUCTION REQUIREMENT</u> | <u>PROTECTION REQUIREMENT</u> |
|---------------------------------|--|--|
| Above 40°F | Normal masonry procedures. | <i>Cover walls with plastic or canvas with no open seams at end of work day to prevent water entering masonry.</i> |
| 40°F – 32°F | Heat mixing water to produce mortar temperatures between 40°F – 120°F. | <i>Cover walls and materials to prevent wetting and freezing. Covers should be plastic or canvas.</i> |
| 32°F – 25°F | Heat mixing water and sand to produce mortar temperatures between 40°F – 120°F. | <i>With wind velocities over 15 mph, provide windbreaks during day and cover walls and materials at the end of the work day to prevent wetting and freezing.</i> |
| 25°F – 20°F | Mortar on boards should be maintained above 40°F. | <i>Maintain masonry above freezing for 16 hours using auxiliary heat or insulated blankets.</i> |
| 20°F – 0°F and below | Heat mixing water and sand to produce mortar temperatures between 40°F – 120°F. | <i>Provide enclosures and supply sufficient heat to maintain masonry enclosure above 32 F for 24 hours.</i> |

Note: Construction requirements, while work is in progress, are based on *ambient* temperatures.

Protection's requirements, after masonry is placed, are based on *mean* daily temperatures.

- I. Hot Weather Application – The Contractor shall keep the areas being built sufficiently moist at all times during the operations. Mortar mixed and ready for application shall be used within one hour's time and continually remixed to prevent excessive evaporation of moisture from the mortar. Discard all mortar, which has

begun to set or is not used within two (2) hours' time. Water for tempering shall be available at all times.

- J. Under no circumstances shall the Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.
- K. All areas of existing brick masonry or flashings removed shall be replaced or made secure and weathertight during the same day. No building interiors, whether new or existing shall be left exposed to the weather at the end of each workday.
- L. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray, and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures, or personal property. Specific attention is drawn to the use of chemicals and cleaners.
- M. No brick masonry shall be installed until it has been reviewed and approved by the Owner for acceptability as to appearance and color match.
- N. Fully charged, inspected, and approved fire extinguishers shall be on site at all times. No cutting, grinding, or welding of any kind shall proceed without an approved fully charged fire extinguisher.
- O. The general nature, approximate quantity, and surface area of the various work items are shown on the Contract Drawings.

1.6 ROOF, GROUNDS, AND BUILDING PROTECTION

- A. The existing roof, grounds and building systems shall be totally protected during the renovations. The Contractor is responsible for any damages to the existing building systems.
- B. Install canvas over all wall penetrations and over roof systems during brick masonry repair work and cleaning.
- C. The Contractor is responsible for the prompt repair of any damage to the building systems resulting from the work at the project at no additional cost to the Owner.

1.7 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00, Shop Drawings and Submittals.
- B. The Contractor shall submit the following items with their submittal package:

1. Methods of removal of materials
 2. Temporary protection procedures
 3. Staging/set-up procedures
 4. Program for containment of cleaning chemicals
- C. Submit certificates attesting compliance with the applicable specifications for the grades, types, and classes of brick masonry.
- D. Submit a range of brick masonry units and mortar samples to match the existing color, size, and texture.
- E. Proposed method for providing shoring during the installation of new throughwall flashing.
- F. Proposed method of providing a dust proof site (dust removal) during masonry demolition work.
- G. Proposed method of protection for adjacent building, landscaping, pavement, walkways, site plantings, and related sitework from damage.

1.8 QUALITY ASSURANCE

The Contractor shall utilize skilled and experienced specialty workers having a minimum of five (5) years' experience in **masonry repairs** to perform the work. Experienced trade workers shall be utilized for all aspects of the masonry work.

1.9 REFERENCE STANDARDS

- A. ASTM C144-04 Specification for Aggregate for Masonry Mortar
- B. ASTM C150-09 Specification for Portland Cement
- C. ASTM C207-06 Specification for Hydrated Lime for Masonry Purposes
- D. ASTM C270-10 Standard Specification for Mortar for Unit Masonry
- E. ASTM C67-09 Test Methods of Sampling and Testing Brick and Structural Clay Tile
- F. ASTM C114-10a Test Methods for Chemical Analysis of Hydraulic Cement
- G. ASTM C216-10 Specification for Facing Brick (Solid Masonry Units made from Clay or Shale)
- H. BIA (Brick Industry Association) Technical Notes
- I. National Park Service (NPS) Technical Preservation Briefs

1.10 TEST AREAS

- A. Prior to commencement of demolition operations, the Contractor shall be required to perform on-site procedure mock ups for masonry removal and reinstallation to ensure that dust and debris containment is acceptable. No brick masonry work can commence until the means and methods have been approved.
- B. Brick masonry and mortar mockups shall be installed within the wall and allowed to cure prior to being reviewed.
- C. Before full-scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture, and appearance match with the existing construction. Test areas shall be performed at each building location and be subject to approval.
 - 1. One (1) square foot of mortar repointing
 - 2. Two (2) linear feet of throughwall flashing with solder and end dam
 - 3. Two (2) square feet of masonry rebuilding
- D. Prepare, install, and cure all materials in accordance with these specifications and the manufacturer's instructions.
- E. Trial areas shall be repeated until acceptable results are obtained. The accepted work shall be a standard for all subsequent work. Areas of masonry replacement shall be allowed to weather for seven (7) days prior to Owner acceptance.

1.11 EXISTING CONDITIONS

Any item which does not match with the original profile may be subject to removal at no additional cost to the Owner.

1.12 CLEANUP

- A. Site cleanup shall be complete and performed daily to the satisfaction of the Owner.
- B. All roof, building (interior and exterior), landscape, and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.
- C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

1.13 GUARANTEES

Upon completion of the work and prior to final payment, the Sub-Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 – MATERIALS

2.1 SALVAGED MATERIALS AND ITEMS

All building materials, equipment, and debris of whatever nature from the portions of the existing structure removed under this project and not designated to be reused or reinstalled shall become the property of the Contractor and legally disposed of offsite. The Contractor will be required to place all discarded materials in the appropriate rubbish receptacles for legal disposal by the Contractor.

2.2 BRICK MASONRY

- A. Replacement brick masonry shall conform to ASTM C 216, Grade SW, Type FBS specifications. Brick shall match existing in size, configuration, color, and texture. These units vary and will require confirmation prior to ordering.
 - 1. Joseph M. Downes Garage: The exterior finish brick appears to be a standard size brick, 2-1/4" x 3-5/8" x 8". Contractor to field verify all brick masonry unit dimensions.
 - 2. George A. Ayotte Garage: The exterior finish brick appears to be an econo size brick, 3-5/8" x 3-5/8" x 7-5/8". Contractor to field verify all brick masonry unit dimensions.
- B. All brick shall be submitted to the Owner for acceptability as to color and appearance to match with the existing brick. The Contractor may be required to submit additional brick samples for approval. No brick shall be purchased or installed until approval by the Owner is obtained. As such the Contractor is requested to provide the Owner with brick samples for review within 10 days upon receipt of contract award.

2.3 MORTAR

- A. Mortar for rebuilding brick masonry shall be Type N, conforming to ASTM C270 specifications, and shall match the existing in color, texture, and appearance. Mortar shall conform to Parts 8 and 11 E of the BIA Technical Notes.
- B. Mortar for repointing shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture, and appearance. Mortar shall be pre-hydrated and conform to Part 7 of the BIA Technical notes.
- C. Portland cement shall be Type II (Type III may be used only if previously approved) conforming to ASTM C150, specifications.
- D. Hydrated lime shall conform to ASTM C207, Type S specifications.
- E. Sand shall conform to ASTM C144, amended as follows:

| Sieve Size | % Passing (By Weight) |
|------------|-----------------------|
| #4 | 100 |
| #8 | 95-100 |
| #16 | 70-100 |
| #30 | 40-75 |
| #50 | 20-40 |
| #100 | 10-25 |
| #200 | 0-10 |

- F. Tinting or coloring agent shall be added to the sand, lime cement to color the fully-cured, in-place mortar to match the physical and chemical characteristics and specified requirements of the Type N mortar.
- G. Admixtures - No admixtures shall be allowed.
- H. Water shall be clean, potable tap water.

2.4 THROUGHWALL FLASHING AND ACCESSORIES

- A. Copper Tin-Zinc alloy coated copper shall be cold rolled sheet copper conforming to ASTM B-101-78, 16 oz. Tin-Zinc coating shall be applied by hot dip process to achieve a coating approximately 0.5 mils thick. Sheet length shall be 8' maximum.
- B. Copper fabric flashing shall consist of a full 5 oz. copper sheet permanently bonded between two (2) layers of textured, woven high tensile strength glass fabric with asphalt compound or epoxy-based coating. Primers and mastic adhesive required for the proper installation of the fabric flashing shall be as specifically recommended by the fabric flashing manufacturer. Fabric flashings shall be as manufactured by York Manufacturing, Inc., Advanced Building Products, Inc., Sandell Manufacturing Company, Inc. or approved equal.
- C. All accessories, including but not limited to nails, screws, and clip strips shall be copper or brass and completely compatible with the surrounding metal to prevent galvanic reaction.
- D. Concealed sealant for metal-to-metal connections, or for seating termination bars: ASTM C1085, single component, butyl (polyisobutylene) rubber sealant, heavy bodied for joints with limited movement.
- E. Termination bar shall be 1/8" x 1" copper bar with pre-punched holes spaced at 8" on center.
- F. Fasteners for securing termination bar at top of through wall flashing and blind nailers, shall be 1" to 1-1/2" long drive pins with zinc alloy sheaths as manufactured by Star, Rawl, or approved equal.

- G. Rivets shall be 3/16" diameter copper.
- H. Solder for copper shall be pure tin conforming to ASTM B32 or lead-free, high-tin.
 - 1. Flux for copper solder shall be in accordance with the requirements of ASTM B813.
- I. Sheet metal flashings shall be shop fabricated. All breaks, bends, and hems shall be uniform, clean, straight lines.
- J. Sheet metal flashings shall be shop fabricated. All breaks, bends, and hems shall be uniform, clean, straight lines.
 - 1. Drip edges shall extend a minimum of 1/2" beyond the finish face of brick masonry, be hemmed 3/4" wide and break at a 30° angle.
 - 2. All copper joints shall be soldered.
- K. Seams shall be overlapped 6" minimum, riveted, and soldered completely enveloping the rivets in solder. The contractor is to confirm seam spacing with the approved manufacturer to prevent deforming of the metal such as oil canning.
- L. Dowels for masonry caps shall be 1/2" diameter threaded stainless steel or hot dip galvanized anchor rod.
- M. Adhesive for Dowels shall be injectable mortar HIT-HY 200-R as manufactured by Hilti.

2.5 FABRICATION SCHEDULE

- A. The Contractor shall coordinate the use of compatible metals to prevent galvanic corrosion.
 - 1. 16 oz. Tin-Zinc Copper
 - a. Throughwall Flashing
 - b. End Dams
 - c. Blind Nailers
 - d. Clips
 - e. Cap Flashing
 - f. Thimble flashing
 - 2. 24 oz. Tin-Zinc Copper
 - a. Hook Strip

2.6 MASONRY TIES

- A. Anchors for use at new through wall flashing locations shall be dual leg adjustable pintel, 1/4" diameter stainless steel tie such as Series 316 as manufactured by Heckman, D/A 5213 as manufactured by Dur-O-Wall, or approved equal.

- B. Anchors for tie back at rebuilding masonry walls shall be 12-gauge hot dip galvanized weldable tie with 3/16" pintel such as VBT series in combination with 359-FH tie as manufactured by Dur-O-Wall, or approved equal.

2.7 MASONRY CLEANERS

- A. Cleaner for newly rebuilt brick masonry shall be a cleaner specifically designed for removing excess mortar stains and new efflorescence from masonry. Cleaner shall be Sure-Kleen 101 lime solvent by Pro-So-Co, Inc., Hydroclean HT455 Excess Mortar Remover by Hydrochemical Techniques, Inc., 200 lime solvent as manufactured by Diedrich Technologies, or approved equal.
- B. The cleaner shall be specifically recommended by the manufacturers for the removal of stains and efflorescence from brick masonry, Radonseal Efflorescence cleaner, or approved equal. Cleaners with harsh chemicals and/or strong acids are not recommended but may be considered. Windows should be protected when using cleaners.
- C. Cleaner for removal of biological growth, such as moss, algae, lichens, etc., shall be EnviroKlean BioWash by Pro-so-co, Inc., D/2 Biological Solution by Cathedral Stone Products, or approved equal.
- D. Cleaner for removal of atmospheric staining and 100% cleaning shall be Safe Restore Restoration Detergent by EaCo Chem, EnviroKlean SafRestorer by Pro-so-co, Inc., EnviroKlean EK Restoration Cleaner by Pro-so-co, Inc., Envirestore 100 by Diedrich Technologies Inc., KEIM Stone Cleaner N by KEIM Mineral Products of America or approved equal. If these cleaners do not provide acceptable results, the Contractor may provide alternative cleaners such as SureKlean Light Duty Restoration Cleaner (-NE) by Pro-So-Co, Inc., SureKlean Heavy Duty Restoration Cleaner by Pro-So Co, Inc., Hydroclean HT-626 Brick, Granite, Sandstone or Terra Cotta Cleaner by Hydrochemical Techniques, Inc., 101G-Granite, Terra Cotta and Brick Cleaner by Diedrich Technologies Inc., or approved equal.
- E. Masking materials shall be commercially available masking or duct tape of appropriate width. Self-adhesive materials shall be completely strippable, leaving no adhesive residue when removed.
- F. Plastic sheet for masking tape areas shall be 4 mil. thick minimum, polyethylene sheet of appropriate size to cover the required areas.

2.8 WEEPS

Baffles to be installed in full head joint weeps of brick masonry shall be 3/8" x 2-1/2" x 3-3/8" baffle comprised of a bonded cellular material such as Wire Bond - Cell Vent, No. 3601 as manufactured by Masonry Reinforcing Corporation of America, Quadro-Vent by Hohmann & Barnard, Inc., Cell Vent by Dur-O-Wall, Inc., or approved equal.

2.9 SEALANT AND ACCESSORIES

- A. Sealant for exposed locations shall be a one-part polyurethane conforming to ASTM C920-87, Type S, Grade NS, Class 25, Uses NT, M, A, and O such as manufactured by Tremco, BASF-Sonneborn, Sika Corp., or approved equal.
- B. Mastic shall be cold-applied, polymeric, single-component sealant compound.
- C. Color(s) shall be selected by the Owner from the approved manufacturer's color chart. Colors shall be the manufacturer's available premium colors.
- D. Primer shall be non-staining type as manufactured or recommended by the sealant manufacturer for each substrate.
- E. Substrate cleaner shall be non-corrosive and non-staining as recommended by the sealant manufacturer. Cleaner shall be totally compatible with the sealant for each substrate.
- F. Bond breaker tape shall be pressure-sensitive tape as recommended by the sealant manufacturer.
- G. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Follow all applicable local, state, and federal requirements regarding construction of scaffolding and protection of the public safety. Specific reference should be made to OSHA Construction Safety Regulations.
- B. Set up of scaffolding or similar access and location of on-site storage areas shall be subject to review and approval by the Owner.
- C. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.
- D. During freezing weather, the Contractor shall protect all masonry with tarpaulins or other approved material. Masonry materials shall be stacked on platforms and covered, or stored in a manner acceptable to the Owner, to protect them from contact with soil and weather exposure. Materials with stained faces will not be used in the walls.

- E. No masonry work shall be executed when the temperature in the work area has dropped below 40 degrees F unless it is rising. The Contractor shall provide heat and maintain the temperature of masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of masonry materials to at least 40 degrees F, but not more than 100 degrees F, and maintain an air temperature above 40 degrees F on both sides of completed masonry for a period of at least 72 hours.
- F. Keep covers tightly sealed on all evaporative products to prevent premature curing.
- G. Masonry work, including cleaning, shall be performed prior to replacement of the roofing beneath. The entire roof adjacent to masonry work must be protected with 1/2" minimum rigid insulation with plywood atop.
- H. All debris shall be transported to dumpsters, in locations approved by the Owner, at ground level by enclosed chute or crane and scaling bucket. Uncontrolled dropping of debris to ground level will not be permitted.
- I. During the removal of any existing component, the Contractor shall report to the Owner any areas of damaged, deteriorated or otherwise unsuitable framing, wood blocking, or wall materials uncovered during the work. Do not cover unacceptable areas until reviewed by the Owner and Engineer. Provide temporary protection to the area in question.
- J. Any wall areas opened for replacement shall receive the new system that day and shall be enclosed with masonry. Should rebuilding of masonry not be completed, temporary weather protection and shoring for the wall shall be provided by the Masonry Contractor at no additional charge to the Owner.
- K. If needed, the Contractor shall lay-up replacement brick masonry units plumb, level, and true to the lines and dimensions at the existing walls. Chipped or broken units shall not be used. If any such units are placed in the finished wall, they shall be removed and replaced with new units conforming to the specifications at no additional cost to the Owner.
- L. Refer to Brick Industry Association (BIA) technical notes for standard practice for masonry repointing, rebuilding, and repair.
- M. Adjacent bricks damaged or removed as a result of the repointing work or brick removal will be removed and replaced at no cost to the Owner.

3.2 MASONRY STORAGE

Storage of all masonry shall be in the area designated by the Owner. All stored masonry units shall be covered.

3.3 REMOVAL OF BRICK MASONRY

- A. Remove cracked or spalled brick masonry units in the locations shown on the Contract Drawings. Use hand and power tools to remove masonry. Pneumatic demolition tools are not permitted.
- B. Remove maximum four (4) linear foot sections of masonry walls at a time, or as required to prevent deflection or displacement of the existing masonry to remain. Shore the sections as required to prevent displacement.
- C. Saw-cut surrounding mortar joints to remove the designated masonry units. Remove adjacent units as required. Provide temporary shoring and protection as necessary.
- D. Remove masonry units in a manner so as not to damage sound materials designated to remain.
- E. All throughwall flashings shall extend a minimum of 8" above the limits of the roof edges and shall be terminated with an end dam.

3.4 TEMPORARY SHORING

- A. It is the responsibility of the Contractor to design, erect, and maintain all necessary shoring procedures sufficient to comply with applicable regulations, securely support all masonry or other elements left unsupported by the required removals and permit the work of other trades to proceed.
 - 1. If cracks occur in mortar joints of brick intended to remain, completely stabilize the area with additional shoring or new construction, cut out the damaged joint area and repoint it after removal of shoring. Secure the Engineer's approval of repair.
 - 2. Solidly patch all holes (with new mortar) left in mortar by withdrawal of shore fastenings.
 - 3. Completely remove shoring system when no longer needed.
 - 4. Notify the Owner 48 hours in advance of installation of shoring.
 - 5. The maximum spacing of temporary shoring vertical supports shall be twelve (12") inch on center.
 - 6. The addition of temporary lateral bracing or blocking between vertical shoring elements is required.
 - 7. A sequenced shoring scheme is recommended at all shoring applications. The minimum length of remaining solid masonry wall located between each removed masonry section shall be four (4) feet.
 - 8. Masonry and flashing replacement work must be completed in the same day that existing components are removed, unless adequate temporary weather protection is provided to the satisfaction of the Owner and Engineer. Submit the intended demolition, shoring, and construction sequencing to accommodate this requirement. Submit the means and methods of temporary weather protection to include materials and methods of fastening or securing.

9. Submit the means and methods of temporary protection to low roof areas and their components.
10. Submit the means and methods of temporary covering or masking of wall and roof penetrations, grills, vents, and mechanical units.
11. All temporary shoring of the brick masonry components to complete the masonry and flashing repairs will be the sole responsibility of the masonry Contractor. The Contractor must supply, install, and maintain all temporary shoring for the duration of the project.

3.5 SOLDERING OF SHEET METAL

- A. Refer to the publication, "Copper and Common Sense" by Revere Copper and Brass and all recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) concerning methods and materials to be used in the fabrication and construction of sheet metal flashings.
- B. It is the intent of this Specification to utilize the most effective joint configuration possible to properly install strong, weathertight, metal flashings. Comply with the following standards unless otherwise specified when fabricating metal components to be joined:
 1. Whenever one-piece construction is not possible, solderable metals shall utilize interlocked, crimped, and fully soldered seams and joints.
 2. Seams and joints of non-solderable metals shall be interlocked, riveted, and completely filled with sealant.
- C. Comply with Military Specification MIL-S-6872B entitled, "General Specifications for Soldering Process" when forming soldered joints. Use conduction soldering methods. Clean areas to be joined of oil, grease, pencil marks, paint, dirt, or other foreign substances. Remove burrs using files, grinding stones, or other methods. Hold parts in place using clamps, jigs, and supports or by self-fixturing. If parts are tack-soldered to hold them in place, the area of tack-soldering shall be reworked into the final soldering. Parts cannot be allowed to move during the soldering process.
- D. Apply flux to surfaces that are to receive solder. Do not use flux-cored solder. Flux shall be fluid when heated and effective in removing and excluding oxides and other impurities from the joint. The molten solder should readily displace flux.
- E. Heat areas to be joined above the liquidous temperature of the solder. To deliver maximum heat, apply the copper bit of the soldering iron at the right angle so that the flat side of the iron's bit provides maximum contact area. Apply solder to the joint and not the bit of the iron. Allow solder to flow in place to provide a minimum 1-inch final width of solder over the joint. Do not disturb the joint until it has been allowed to completely cool. After soldering, completely remove flux and acid by washing and scrubbing with a neutralizing agent.

- F. Shop fabricate sheet metal flashings to the fullest extent possible. Fabricate all breaks, bends, and hems with uniform, clean, straight lines.
- G. Sheet metal flashings shall be as specified herein and as required to match the existing sheet metal systems. Refer to the publication, "Copper and Common Sense" by Revere Copper and Brass and all recommendations of the Sheet Metal and Air Conditioning Contractors National Association concerning methods and materials to be used in the fabrication and construction of sheet metal flashings.

3.6 THROUGHWALL FLASHING INSTALLATION

- A. Fabricate and install new flashings a minimum of 8" above the finished roof surface and as shown on the Contract Drawings. Refer to Contract Drawings for configuration of end dams.
- B. Fabricate new flashing and extend rear leg of flashing 3-inches minimum up the back of the wall or as shown on the Contract Drawings. Secure the rear leg of the flashing to the back-up masonry wall with the specified fasteners and termination bar. Provide a full bead of sealant behind the flashing.
- C. Secure rear leg of flashing to substrate with the specified fasteners and termination bar at 8" on center.
- D. Provide the finish profile for the exposed portion of the flashing as shown on the Contract Drawings, with hemmed edge formed drip extending ½" beyond finish face of masonry.
- E. Overlaps in flashing shall be 6" minimum and soldered. Rivet overlaps and solder watertight completely enveloping rivets in solder.
- F. Form the flashing to shed water. Provide 2" high end dams at limits of throughwall flashings. Provide completely watertight seams and overlaps. Rivet and solder end dam connections. End dams shall be 2" high minimum.
- G. Install copper fabric flashing in a full bed of mastic over the vertical surface of the existing concrete masonry back-up wall and flashing. All seams shall be lapped 6" minimum and set in full bed of sealant. Secure copper fabric to masonry backup wall with pre-punched termination bar at 8" on center. Extend fabric ½" minimum beyond the exterior face of the brick masonry wall face, 8" minimum up the back of wall and lap onto metal flashings as indicated in the Contract Drawings. Provide a bead of sealant at the top of the reglet / termination bar, tooled to shed water.
- H. Note: provide field confirmation of all dimensions prior to fabricating the flashings. Where irregularities in the surface occur, backer rod and filler material can be used to provide positive support for the fabric coated copper flashings. Unsupported flashing will not be acceptable.

3.7 BRICK MASONRY REPLACEMENT

- A. Ensure that proper installation of new throughwall flashings has been performed. Install weeps at base of new throughwall flashing at 24" on center, maximum. Weeps are to be set directly on the through wall flashings without a bed of mortar. Should the weeps be set in the mortar bed, they shall be spaced at 16" on center, max.
- B. Reconstruct brickwork with new brick to follow the existing profile and configuration. All brick masonry shall be plumb, level, and true to the lines and dimensions of existing wall. Chipped or broken units shall not be used. If any such units are placed in the finished wall, they shall be removed and replaced with new units at no additional cost to the Owner.
- C. Provide supplemental anchors into the back-up wall at 16" on center both horizontally and vertically. Where anchors penetrate throughwall flashings, seal fastener heads with mastic to provide a watertight assembly.
- D. The Contractor shall supply all jacks, shoring, and temporary supports necessary to support brickwork above and adjacent to any area to assure proper installation of the work. The Contractor will be responsible to remove and reinstall this shoring as required for the Roofing Contractor to install the new flashings.
- E. Wet all new and existing masonry units in the work area. Masonry shall be kept damp but without standing water.
- F. Utilize rotary mixers when fabricating all mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. No anti-freeze compounds or other substances shall be added to the mortar. Mix all mortar for at least three (3) minutes and not more than five (5) minutes with the minimum amount of water to produce a workable consistency. The maximum allowable air content of cured mortar shall be 12% by volume. Retempering of mortars that have stiffened because of evaporation of water will be allowed in order to provide the proper consistency provided all mortar in a batch is utilized within two (2) hours of initial mixing.
- G. Set each brick in a full bed of mortar and build upward. Tool all joints to a concave profile. Fully butter all heads.
- H. Exercise extreme caution to avoid damaging the existing flashing.
- I. Work mortar into joints for complete width and depth. Consolidate and tool into joint using concave tooling equipment to completely fill the joint cavity to match the existing joint profile. Tool exposed joints slightly concave with a round or other suitable jointer when the mortar is thumbprint hard. For horizontal joints, jointers shall be at least 12 inches long for brickwork. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units,

compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool vertical joints first. Brush joints to remove all loose and excess mortar. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall.

- J. Set new masonry unit in full beds of mortar, top, bottom, and sides. Utilize slate wedges as required to maintain mortar joint width. Masonry above throughwall flashings shall be set in full beds of mortar. Should new masonry set in mortar require removal due to un-level/plumb conditions, that masonry unit shall be removed from the work area, cleaned and allowed to dry prior to reinstallation.
- K. Provide full joint depth of new mortar. Strike off and tool joints to match existing joint configuration. Allow areas to fully cure prior to cleaning.
- L. Extreme care shall be taken not to spill mortar into the wall cavity blocking wall drainage, while laying mortar bed for brick work. Any mortar spilled mortar shall be removed from the throughwall flashing prior to closing the opening.
- M. Totally clean the areas of masonry rebuilding only after the rebuilding is completed and the mortar has been allowed to cure for 8 days minimum. Clean surfaces free of all dust, dirt, and mortar stains as described in this section.

3.8 REPOINTING

- A. Any masonry unit damaged during the repointing process shall be replaced by the Contractor at no additional cost to the Owner. Repoint the deteriorated brick masonry mortar joints as designated on the Contract Drawings.
- B. Cut and point all brick masonry mortar joints designated to be repointed.
- C. Refer to Technical Notes, Section 7 of the Brick Industry Association concerning methods and materials for tuck pointing repairs.
- D. Remove existing mortar to a depth of at least $\frac{3}{4}$ " in the areas to be repointed. Removal shall be accomplished using hand and power tools so as not to damage the existing brick. Remove both horizontal and vertical joints. Brush the joint clean of all loose mortar and dust and wet the exposed surface down with a light water spray. Keep exposed surface damp throughout procedure.
- E. Utilize rotary mixers when fabricating mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. No antifreeze compounds or other substances shall be added to the mortar. Mix dry ingredients before adding water. Mix all mortar for at least 3 minutes and not more than 5 minutes with the minimum amount of water to produce a workable consistency. The maximum allowable air content of cured mortar shall be 12% by volume. Retempering of mortars that have stiffened because of evaporation of water will be

allowed in order to provide the proper consistency, provided all mortar in a batch is utilized within 2 hours of initial mixing.

- F. Pre-hydrated mortar shall be used for tuck pointing of masonry. Add only a sufficient amount of water to produce a damp mass of such a consistency that it would retain its form when pressed into a ball with hands, but will not flow under a trowel. Allow mortar to stand for not less than 1 hour nor more than 2 hours. Be sure that the color and texture sample of the cured mortar has been viewed and approved by the Owner.
- G. Work mortar into prepared joints for complete width and depth. Consolidate and tool into joint using concave tooling equipment to completely fill the joint cavity and to match the existing joint profile. Repoint rebuilt masonry areas along with the existing. Repointed masonry shall be raked or concave as required to match the existing wall mortar joints.
- H. Protect areas of repointing from inclement weather during cure.
- I. Allow repointing areas to fully cure prior to masonry cleaning as described in this section.

3.9 MASONRY CLEANING

- A. Totally clean all rebuilt masonry areas of all construction stains and excess mortar. Do not perform any cleaning until mortar joints and adjacent sealants are fully cured.
- B. Test the specified cleaners on a small area of masonry wall to determine compatibility with the masonry, window units, sealants, etc. Evidence of discoloration, metallic salts, or other detritus shall be grounds for requiring the use of a substitute cleaner.
- C. The Contractor will be required to clean the masonry units with the minimum cleaning solution mix ratios as recommended by the cleaner manufacturer. Should the minimum dilution ratios not clean the masonry, the Contractor will be required to slightly decrease the dilution rates to clean the surfaces. It is recommended that the Contractor use care when performing the masonry repairs to prevent increasing the mixing solutions.
- D. Apply the cleaner at the manufacturer's recommended dilution rate and dwell duration. Pre-wet the wall if the manufacturer so recommends.
- E. Allow the cleaner to stand for the manufacturer's recommended dwell period while monitoring to ensure that the surface does not dry. Steel bristle wire brushes are not to be used.
- F. Rinse all cleaner from the wall with water applied at the manufacturer's recommended flow and pressure. High pressure washing equipment may be required. Any acid neutralizing agent required by the manufacturer shall be applied

as part of this rinse. Ensure that effluent does not accumulate at ground level, and fully rinse all effluent from sidewalks, streets, and landscaping each day.

- G. The Contractor must provide sufficient site protection to prevent the cleaning effluent from draining into the adjacent storm drains. The Contractor will provide a narrative as to how the site protection will be performed.

3.10 DOWEL INSTALLATION

- A. Core dowel holes through masonry wall at spacing and embedment indicated on the drawings and install adhesive and threaded rod.
- B. Install threaded rod and thimble flashing and solder to copper flashing.

3.11 SEALANT INSTALLATION

- A. Install sealant at termination bars where shown on the Contract Drawings and as required for the proper completion of the work.
- B. Ensure all existing sealants and other materials have been removed down to clean sound original substrates. Saw-cut, wire brush, chip, or grind as required to achieve suitable substrates for sealant installation.
- C. Clean and prime substrates in strict accordance with sealant manufacturer's requirements.
- D. Precondition sealants to a temperature between 60- and 70-degrees F or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between 60- and 85-degrees F.
- E. Joint primer shall be applied to all properly prepared, cleaned, and dry substrates. Primer shall be approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.
- F. Sealant shall have a minimum application life of three (3) hours after mixing.
- G. Unless otherwise required by the sealant manufacturer, the sealant shall be mixed for a period of 6 minutes minimum with a slow speed electrical drill and mixing paddle. The sides of the container shall be repeatedly scraped to ensure adequate mixing.
- H. Sealant shall be applied to clean, dry, joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.
- I. All joint sealant shall be immediately tooled to assure full adhesion. Sealant shall be dry tooled, straight, uniform, smooth, and neatly finished to the profiles detailed. No soaps, wetting or slicking agents will be allowed.

3.12 CLEANUP

Prior to acceptance of the masonry work covered in this section, the Contractor shall perform a thorough cleanup of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

I:\837920\02 Design\specs\837920 04 50 00 Masonry.docx

ROUGH CARPENTRY

SECTION 06 10 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all sections within Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 07 53 00 – Elastomeric Roofing and Flashing

1.3 SCOPE OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice and as required by the material manufacturer, as amended. The work under this Section generally includes the following:
 - 1. Coordinate this work with all trades to provide orderly progress of the tasks.
 - 2. Remove and replace deteriorated interior finishes at locations as indicated on the Contract Drawings.
 - 3. Install PVC baseboard at locations as indicated on the Contract Drawings. PVC shall be painted a color as approved by the Owner.
 - 4. Remove and replace interior finishes as necessary to access roof drains.
 - 5. Clean and restore all areas affected by the work.

1.4 SPECIAL JOB CONDITIONS

- A. The building occupants are highly sensitive to fumes, odors, noise, and disturbances. The Contractor shall submit a detailed sequence schedule for the roof area prior to the start of work and coordinate daily schedules with the Owner.

1.5 JOB CONDITIONS

- A. All surfaces to receive the new wood blocking shall be thoroughly dry. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surface prior to application. Do not dry with open flames.
- B. Coordinate this work with the work described in other Sections of this Specification.
- C. Do not leave any newly installed wood blocking exposed. Cover and protect all newly installed wood daily with the new flashing system.

- D. Protect all existing and new wood stored on site to prevent moisture absorption. Use tarps over the wood pile (top, sides, and bottom) elevated on pallets (one side lower to shed water).
- E. Verify condition and securement of existing wood blocking designated to remain. Verify that existing wood blocking fasteners to deck are specified fasteners spaced 24-inches on center maximum.
- F. If delays in the project exceeding one (1) week are anticipated due to inclement weather (or due to any other condition), all wood shall be stored in weatherproof box trailers or storage sheds in locations to be designated by the Owner.

1.6 REFERENCE STANDARDS

- A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
- B. APA – THE ENGINEERED WOOD ASSOCIATION
- C. NATIONAL DESIGN SPECIFICATION (NDS)
- D. AMERICAN FOREST AND PAPER ASSOCIATION (AFPA)
- E. AWPA – AMERICAN WOOD PROTECTION ASSOCIATION

1.7 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.
- B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- C. Contractor to provide site safety plan and Job Hazard Analysis.

1.8 QUALITY ASSURANCE

- A. Forest Certification: Provide rough carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC's "Principles and Criteria for Forest Stewardship."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.10 GUARANTEE

- A. The Contractor shall supply the Owner with a minimum two (2) year workmanship warranty for their work. In the event any work related to this section is found to be defective within two (2) years of substantial completion, the Contractor shall remove and replace such at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 DIMENSIONAL LUMBER

- A. All dimensional lumber for roofs and walls shall be construction grade Douglas Fir, Hem-Fir or Southern Yellow Pine, formed to the dimensions shown on the Detail Drawings and as required for proper installation of the new work. All new exterior perimeter woodwork, nailers, and wood blocking used on the building shall be minimum 6-inch wide, except where otherwise detailed. Wood furring/blocking shall be permitted to be minimum 4-inch wide at expansion joints and wall locations.
- B. All woodwork shall have a maximum moisture content of 19% by weight on a dry weight basis. Kiln drying may be required to conform to maximum 19% moisture content.
- C. Pressure treated wood blocking/sleepers will only be permitted when wood furring or blocking is in direct contact with concrete, masonry, or exposed to the exterior.
- D. Shims for roof edge blocking shall be continuous cedar of the size required to provide a sloped surface for the roof edge detail as shown in the Contract Drawings.

2.2 PLYWOOD

- A. Plywood shall be APA Grade CD, Exterior, minimum ½-inch thick for wall systems, unless designated otherwise on the detail drawings. Pressure treated plywood will not be permitted.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Rooftop equipment bases and support curbs.
 - 2. Blocking.
 - 3. Nailers.
 - 4. Treated wood for furring.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.4 FASTENERS

- A. In general, all fasteners, anchors, nails, straps, and other accessories shall be of stainless steel, galvanized steel, or fluorocarbon coated steel. Galvanizing shall be hot dip in accordance with ASTM A153 Specifications. Electro-galvanized items shall not be used.
- B. Fasteners for securing wood blocking to wood blocking shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the receiving member 1-1/2-inch minimum, except full depth into plywood.
- C. Fasteners for securing wood blocking to wood decking shall be #14 self-drilling, self-tapping, fluorocarbon coated screws of sufficient length to penetrate the decking 1" minimum, 1-1/4" maximum.
- D. Fasteners for securing wood blocking and plywood to steel shall be Number 12 minimum coated steel deck screws, with a minimum 1-inch embedment.
- E. Fasteners for securing wood blocking to concrete substrates shall be one-piece fluorocarbon coated, 1/4" diameter flat head anchors such as Rawl drives by the Rawl Plug Company or approved equal, with a minimum 2-inch' embedment into the substrate.
- F. Fasteners for securing plywood to concrete and masonry surfaces shall be 1/4-inch diameter hammer drive anchors with zinc-alloy sheaths and stainless-steel inserts as manufactured by Star Fasteners, Rawl, OMG or approved equal. Anchors shall be of sufficient length to penetrate the receiving substrate 1-1/4-inch minimum.
- G. Fasteners for securing wood blocking to CMU blocks and brick masonry units shall be Kwik-Con II+Torx Hex Screw Anchor as manufactured by Hilti or approved equal. Fasteners shall be of sufficient length to penetrate the receiving substrate 1-3/4" minimum.
- H. Fasteners for securing storefronts and wood blocking to concrete or brick masonry shall be 1/2" diameter stainless steel epoxy anchor bolts. Anchors shall be of sufficient length to penetrate the substrate 4-1/2" minimum. Anchors shall be Chem Stud Bolts as manufactured by the Rawl Plug Company, Parabond by Molly, Hit C-

20 System by Hilti or approved equal. Revisions to anchor size and strength shall be as recommended by the storefront manufacturer.

- I. Fasteners for securing wood blocking to steel framing shall be ¼" diameter flat head type stainless steel self-tapping screws. Shank shall be of sufficient length to penetrate the substrate 1" minimum.
- J. Fasteners for securing wood blocking and PVC trim to brick masonry and CMU block surfaces shall be ¼" diameter hammer drive anchors with zinc-alloy sheaths and stainless-steel inserts as manufactured by Star Fasteners, Rawl, OMG, or approved equal. Anchors shall be of sufficient length to penetrate the receiving substrate 1-1/2" minimum.
- K. Fasteners for securing wood blocking and PVC trim to steel shall be 1/4" diameter flat head type stainless steel self-tapping screws. Shank shall be of sufficient length to penetrate the substrate one-inch (1") minimum.
- L. Adhesives for making PVC to PVC connections shall be a PVC cement specifically recommended by the cellular PVC manufacturer.
- M. Sealant for the application of countersunk screws shall be a polyurethane caulking recommended by the cellular PVC manufacturer.

2.5 INTERIOR GYPSUM BOARD

- A. Gypsum wallboard shall be 5/8" thick, paper face with a tapered edge. Gypsum board shall meet ASTM C1396 Standard Specification for Gypsum Wallboard.
- B. Joint compound shall be premixed conforming to ASTM C475 Specifications. Compound shall be asbestos free.
- C. Corner beads shall be DUR-A-BEAD No. 103 1-¼" x 1-¼", or approved equal.
- D. Metal Trims shall be No. 200A-J shaped channel 5/8" in size. Plastic tear away trim will be considered.

2.6 PVC TRIM

- A. Interior cellular PVC trim shall have a small cell microstructure and density of .55 grams/cm³ tested in accordance with ASTM D 792 and having a tensile strength of at least 2,256 psi.
- B. Cellular PVC shall be white, color to match existing, or a color as selected by Owner.

2.7 PAINT MATERIALS

- A. Primer for new gypsum board substrates shall be latex undercoat as manufactured by Benjamin Moore, California Products, Inc., Tnemec Company, Inc., Popcorn

Interior Texture Paint as manufactured by Behr, or approved equal.

- B. Paint for new gypsum board at ceiling locations shall be as manufactured by Benjamin Moore, California Products, Inc., Tnemec Company, Inc., or approved equal. Color and finish shall be required to match existing, or as selected by the Owner.
- C. Paint for new PVC trim shall be 100% acrylic latex paint as manufactured by Benjamin Moore or approved equal. Color and finish shall be required to match existing, or as selected by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- F. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

3.2 REMOVAL OF WOOD BLOCKING

- A. Remove and dispose of all deteriorated wood blocking and all blocking scheduled to be removed and replaced in accordance with the Contract Drawings and this Specification.

3.3 FASTENING OF WOODWORK

- A. All new woodwork shall be secured with the specified fasteners spaced 12-inches on center maximum, or unless otherwise specified by Factory Mutual Global's Data Sheet FM 1-49.

- B. All existing woodwork to be reused shall be re-secured with the specified fasteners spaced 12-inches on center maximum, to the roof deck. The Contractor shall be made aware that the re-securement fasteners may need to penetrate multiple layers of existing wood blocking before penetrating the roof deck and shall provide proper length fasteners.
- C. Wood blocking shall be fastened directly to the roof deck with the specified fasteners spaced 12-inches on center maximum, staggered off the centerline of the woodwork being secured. Predrilling of fastener holes shall be completed prior to installing fasteners. Should the wood blocking be greater than a nominal 2x6, fasteners shall be spaced 12-inches on center maximum in pairs.
- D. Wood blocking to wood blocking connections shall be made using the specified fasteners spaced 12-inches on center maximum and staggered off the centerline of the woodwork being secured. Nails shall be of sufficient length to penetrate the receiving member 1-1/2-inches minimum.
- E. Plywood shall be fastened to vertical concrete, CMU, and masonry surfaces with the specified fasteners spaced 8-inches on center both vertically and horizontally.
- F. Plywood shall be fastened to vertical stud framing with the specified fasteners spaced 6-inches on center maximum vertically.
- G. Spacing of fasteners should not exceed 12-inches, 8-feet each way from outside corners. Withdrawal resistance should be 100 lbs. per nail minimum.

3.4 PLYWOOD SHEATHING INSTALLATION

- A. Coordinate this work with that of the other trades to provide the orderly progress of construction and a watertight condition. It is the intent of these specifications to install plywood sheathing at designated parapet walls and where designated on the Contract Drawings.
- B. Secure new plywood sheathing over the substrate accepting the new elastomeric flashings. Where practical, the plywood assembly can be sized to allow the plywood surface to be flush with the wood blocking around the perimeter of the roof system.

3.5 REPAIR OF INTERIOR GYPSUM BOARD

- A. Install new furring strips and/or blocking at the locations where new interior finishes are to be applied. Secure the furring at 8" on center, maximum, into the substrates, or if metal stud tracks are available, at the head and sill of the tracks. Furring strips or studs shall be spaced a maximum of 16" on center, from each other.
- B. Secure new gypsum wall board to the furring strips at 8" on center, vertically. The new wall boards are to span from center line to center line, of the furring strips or existing stud walls.

- C. Secure new corner beads, and apply meshing tape and a minimum of two coats of joint compound to provide a smooth transition between the new and existing surfaces. Sand the joint compound, and prepare the wall for painting.

3.6 PAINTING - GENERAL

- A. Surfaces to receive paint shall meet the requirements established by the manufacturer of the paint and these specifications.
- B. Surfaces to receive paint shall be examined and work shall not be started until defects have been corrected.
- C. Verify that all sealants, have cured for the specified time prior to applying new coatings.
- D. Spaces in which painting is being done shall be properly identified with "Wet Paint" signs or closed to traffic until paint is dry.
- E. Provide adequate ventilation.

3.7 PAINTING - WORKMANSHIP

- A. Employ skilled mechanics to ensure the very best workmanship. Quality workmanship is required. Materials to be applied by craftsmen experienced in the use of the particular product involved.
- B. All surfaces shall be properly smoothed. All surfaces shall be properly prepared, clean and dry when a coating is applied. Any bare or abraded spots in base coats shall be touched up before next coat is applied.
- C. Protection against fire shall be taken and all oily rags or waste must be removed from the building each day.

3.8 APPLICATION OF PAINT

- A. All materials shall be applied in accordance with manufacturers' recommendations.
- B. Finishing materials shall be free from skins, lumps or any foreign matter when used, and shall be kept well stirred while being applied.
- C. Spray painting will not be allowed unless approved in writing by the Designer. Apply paint/primer coating with the following appropriate brushes:
 - 1. All latex-based paints and coatings shall be applied with 100% polyester brushes
- D. Each coat of finish shall be evenly brushed out and allowed to dry before any subsequent coat is applied. Each coat shall be a different tint from that of the preceding coat and shall be reviewed and accepted by the Owner before the next coat is applied. Final coats shall be the exact shade and textures selected. The

finished work shall be free from runs, sags, defective brushing and clogging of lines or angles. Drying time between coats of paint shall be in accordance with the manufacturer's labeled instructions.

- E. All surfaces to be painted shall receive one prime coat, and two finish coats, or as required to provide a uniform appearance. Where specified paint coatings are self-priming, the first coating shall be considered a primer and the subsequent coatings shall be applied as specified. Self-priming paints shall not decrease the number or required coatings.
- F. Do not allow primers or intermediate coats to dry more than fourteen (14) days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely and there shall be a visually perceptible difference in shades of successive coats.
- G. Reduce paints to proper consistency by adding fresh paint, do not thin paint.

3.9 PROTECTING AND CLEANING

- A. New wood blocking and plywood shall be kept dry before, during and after installation.
- B. Clean adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Refer to close-out procedures described in Division One of these Specifications for additional information.

END OF SECTION

I:\837920\02 Design\specs\837920 06 10 00 Rough Carpentry.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

TRAFFIC COATINGS AND JOINTS FILED SUB-BID REQUIREMENTS

SECTION 07 10 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Masonry Work" include all of the following listed Specification Sections in their entirety.

SECTION - 01 22 00 - UNIT PRICES

SECTION - 07 18 00 - VEHICULAR TRAFFIC COATINGS

SECTION - 07 91 20 - EXPANSION JOINTS

SECTION - 07 92 00 - JOINT SEALANTS

- D. The Work of this section is shown on Drawings

S001, S101, S102, S103, S104, S105, S106, S107, S108, S109, S110, S111, S112, S113, S114, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S501, S502, S503

E. SUB-SUBS

1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE.
2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\837920 07 01 00 Traffic Coating (Filed Sub-Bid).docx

VEHICULAR TRAFFIC COATINGS

SECTION 07 18 00

(Filed Sub-Bid with Section 07 10 00)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 SUMMARY

- A. Provide a polyurethane traffic coating system as specified and as indicated on the Contract Drawings.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 03 01 30 – Maintenance of Cast-in-Place Concrete
 - 2. Section 03 30 00 – Cast-in-Place Concrete
 - 3. Section 07 91 00 – Expansion Joints
 - 4. Section 07 92 00 – Joint Sealants
 - 5. Section 32 17 23 – Pavement Markings

1.3 PERFORMANCE REQUIREMENTS

- A. Cold fluid applied polyurethane waterproofing system is intended to perform as a continuous barrier against liquid water and to flash or discharge to the incidental water. Membrane system shall accommodate movements of Building materials as required with accessory sealant materials at such locations, changes in substrate, perimeter conditions and penetrations.
- B. Installed waterproofing membrane system shall not permit the passage of water, and will withstand the anticipated traffic wear exposures in accordance with the most current revision of ASTM C957, High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface.
- C. Intent is to bridge and seal the following air and water leakage pathways and gaps:
 - 1. Connections of the walls to the deck.
 - 2. Piping, conduit, duct and similar penetrations.
 - 3. All other air leakage and water intrusion pathways to garage deck structural slab.

1.4 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, staging, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Project Specifications and in accordance with good construction practice. All vehicular traffic coatings shall be completed as part of the scope of work. The work under this Section generally includes the following:

- A. Remove existing coating from the garage floor slab and leading edge. All existing coating remnants, loose concrete, existing sealants, etc. shall be fully removed down to bare, open capillary concrete.
- B. Perform a minimum of two (2) alternating direction passes of shot-blasting to concrete and masonry surfaces to achieve ICRI-CSP 5 surface profile.
- C. Coordinate repairs to the garage floor slab and leading edge with Section 03 01 30 – Maintenance of Cast-In-Place Concrete.
- D. Install new traffic coating system as detailed on the Contract Drawings and specified herein.
- E. Coordinate installation of all sealant joints scheduled to be placed with the traffic coating system indicated in Section 079200 – Joint Sealant.
- F. Clean all areas affected by the work.
- G. Contact, coordinate and pay for coating manufacturer's field representative site services to include review and reporting for each phase of the coating work, including mock-ups.
- H. Provide a laser survey after entire removal of existing waterproofing coating representing all existing concrete surface discrepancies including dips, swales, inconsistent slopes, etc. and intended resolution to maintain a positive pitch-to-drain to alleviate ponding on the new waterproofing coating.
- I. Provide a final condition laser surface survey of new coating system representing positive pitch-to-drain confirming the absence of ponding.

1.5 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.
- B. The Contractor shall submit the following items with their submittal package:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Product data for specified materials.
 - 3. Safety Data Sheets (SDS) for all components.
 - 4. Name and Contact information for manufacturer's technical field representative.

5. Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
6. Manufacturer's current recommended installation procedures.
7. Coating samples to replicate actual specified materials, including each layer, aggregate, topping and project specific thicknesses.
8. Manufacturer's technical representative field reports.
9. Contractor's proposed weekly phasing, schedule, and photographs.
10. Contractor's proposed means and methods, including apparatus, equipment and protective measures for removal of existing coatings and surface preparation of concrete.

1.6 MOCK-UPS

- A. Provide field mock-ups in place to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mock-ups shall be performed prior to the commencement of the full scope of work and shall be reviewed by the Owner, Engineer and Manufacturer's field representative. The following mock-ups shall be performed:
 1. Concrete surface preparation and installation of full coating system in accordance with the Contract Documents over a five (5) square foot area. Each mock-up shall include a different aggregate grit size as specified herein:
 - a. 20 grit (as specified)
 - b. 24 grit (as specified)
- B. After complete placement of mock-ups and Owner, Engineer and Manufacturer representative review, the mock-ups shall be fully removed and the concrete prepared for placement of full coating system.

1.7 CONTRACTOR QUALIFICATIONS

- A. Contractor and his installer(s) shall have satisfactorily completed a program of instruction in proper methods of preparation of the substrate, patching of spalled and delaminated areas, crack and joint repair and traffic coating installation. The applicator shall have in writing, a certificate of approval from the manufacturer.
- B. Contractor shall have a minimum of five (5) years' experience installing this type of surfacing in similar size projects. Contractor shall submit minimum five (5) prior project references, including contact information.

1.8 QUALITY ASSURANCE

- A. The Contractor must coordinate and pay for all manufacturers' site visits to review construction. At a minimum, the manufacturer's representative shall be on site for the following reviews:
 1. Pre-construction meeting.
 2. Concrete surface preparation prior to installation of primer and first coat.

3. First day of waterproofing installation. Representative shall be allowed to review installation of each layer of waterproofing including all layers of wear coat. Broadcast of specified pigmented power tread into grout layer and topping layer must also be reviewed. Representative shall perform adhesion and film thickness tests at a minimum frequency of one (1) per every 100 sq. ft.
 4. Review material storage, mixing, surface preparation, application, curing and temporary protection for each material type or component.
 5. Minimum two (2) site visits per week during installation.
 6. Periodic testing of material thickness for each layer, to confirm conformance to manufacturer's written technical data and these Contract Documents.
- B. For each site visit, the manufacturer's representative shall provide a written field report indicating areas reviewed, procedures used, recommendations made, incorrect installations, corrective actions and photographic documentation. The written field report must include date, time, complete list of personnel on site, areas reviewed with sketch plan identification; placed with photo documents on manufacturer's company letterhead.
- C. The Contractor must submit the manufacturer's reports within two (2) days after the respective site visit.
- D. In all cases and all phases of this project, the Contractor must strictly adhere to the coating manufacturer's current technical specifications and instructions.
- E. Waterproofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of waterproofing terms related to this section.

1.9 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of installation and associated work, conduct a meeting at the Project Site with the installer, Engineer, Owner, manufacturer's representative and any other persons directly involved with the performance of the Work. The Contractor shall record conference discussions and to include decisions and agreements reached, and furnish copies of recorded discussions to each attending party within five (5) business days. The main purpose of this meeting is to review foreseeable methods and procedures related to the Work.

1.10 REGULATORY REQUIREMENTS

- A. Applicable Regulations: Comply with Local, State and Federal codes and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items.)

1.11 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project Site in the manufacturer's unopened containers with all labels intact and legible at time of use. Handle and store materials in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.12 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All Building surfaces (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with the Work.
- C. All trash and debris shall be completely removed from the site daily during the Work and at the completion of the Work. All debris shall be legally disposed of off-site.

1.13 WARRANTY

- A. Contractor shall submit a two (2) year, limited warranty against improper workmanship and defective materials (from date of substantial completion as designated by formal written document submitted by the Contractor).

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The basis of design material shall be as follows as manufactured by Sika Corporation of Lyndhurst, NJ. No material substitute is allowed for the products listed in this Section.

2.2 TRAFFIC COATINGS (SIKALASTIC 720/745 TRAFFIC SYSTEM)

- A. Vehicular Traffic Coating: Sikalastic 720/745 Traffic System comprised of the following:
 - 1. Sikafloor FTP water-based epoxy primer.
 - 2. Sikalastic MT 100% solids epoxy primer (for substrates with elevated moisture content) if required per manufacturers recommendations.
 - 3. Sikalastic 720 Detail Coat.
 - 4. Sikalastic 720 Base Coat.
 - 5. Sikadur 22 Lo-Mod Binder I.
 - 6. Aggregate I broadcast to refusal.
 - 7. Sikadur 22 Lo-Mod Binder II.
 - 8. Aggregate II broadcast to refusal.
 - 9. Sikalastic 745 AL Top Coat.

- B. Applied Total Dry Film Thickness Exclusive of Aggregate:
1. Heavy Vehicular Traffic: 55 mils (minimum).
- C. Aggregate: Aggregate shall be supplied in pre-packaged bags and free of metallic or other impurities.
- D. Base and Top Coats: Physical properties complying with the following.
- | | | |
|--|------------------|------------------|
| 1. Sikalastic | 720 Base | 745 AL Top |
| 2. Pot Life | 10-15 minutes | 20-30 minutes |
| 3. Total Volume Solids (ASTM D2697) | 95% | 100% |
| 4. VOC Content (ASTM D2369) | 59 g/l | 0 g/l |
| 5. Tensile Strength (ASTM D412) | 500 +/- 100 psi | 3200 +/- 300 psi |
| 6. Elongation at Break (ASTM D412) | 800 +/- 50% | 450 +/- 50% |
| 7. Tear Resistance (Die C, ASTM D624) | 300 +/- 25 pli | 350 +/- 50 pli |
| 8. Hardness (ASTM D2240) | 80 +/- 5 Shore A | 85 +/- 5 Shore A |
| 9. Tests were performed with material and curing conditions at 75°F and 50% relative humidity. | | |

2.3 AGGREGATE

- A. Aggregate for vehicular traffic coating system shall be 20 - 24 grit as follows:
1. Aluminum oxide broadcast to refusal; or
 2. Silicon Carbide broadcast to refusal
- B. Contractor must submit samples of each aggregate type of final material texture, color, etc. to the Owner and Engineer for review and approval.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this Section. Notify the Engineer in writing of any discrepancies. Commencement of the work in an area shall mean Contractor's acceptance of the substrate.

3.2 PREPARATION

- A. Substrates shall be clean, dry, sound and free of surface contaminants, with an open capillary concrete surface. Remove all traces of dust, laitance, grease, oils, curing compounds, form release agents and foreign particles by mechanical means, such as milling, scarifying, or shotblasting, as acceptable to the Engineer. Blow surface free of dust using oil-free compressed air line-equipped with an oil trap. All projections, depressions and rough spots shall be dressed off to achieve a level surface prior to the application.
- B. Concrete shall be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by blast cleaning or equivalent mechanical means (ICRI CSP 3 or 4 Surface Profile).

- C. Metal shall be thoroughly cleaned by grinding or blast cleaning.

3.3 PRIMING

- A. Concrete (<4% moisture content by weight, measured with Tramex Concrete Moisture Encounter Meter):
1. For systems requiring primer, apply Sikalastic FTP primer at 300 sf/gal. with a flat squeegee or roller and work well into the substrate to insure adequate penetration and sealing. Puddles are to be avoided.
 2. Refer to data sheet for more detailed information, or consult Sika for other primer options.
 3. Premix both components. Sikalastic FTP, Part "B" is dark olive green in color and may appear black in the container. Sikalastic FTP, Part "A" is light amber in color.
 4. Add the 1 gallon of Sikalastic FTP, Part "A" to the 1.25 gallons of Part "B" in the short filled Part "B" pail. Mix thoroughly with a mechanical mixer (Jiffy) for 3 minutes.
 5. This mixture will appear as a light olive green color.
 6. Slowly add 1.25 gallons of potable water to the mixture under agitation.
 7. Mix for an additional 2 minutes until the mixture is fully dispersed.
 8. Fully dispersed material will appear as light green in color.
 9. Allow primer to cure a minimum of 3-4 hours at 70°F and 50% RH or until tack free before applying base coat.
- B. Concrete (4% to 6% moisture content by weight, measured with Tramex Concrete Moisture Encounter Meter):
1. For concrete substrates with 5% maximum moisture content by weight, apply Sikalastic MT primer at 175 sf/gal. with a flat squeegee or roller and work well into the substrate to insure adequate penetration and sealing. Puddles are to be avoided.
 2. For concrete substrates with >5% up to 6% maximum moisture content by weight, apply a second coat of Sikalastic MT primer at 175 sf/gal.
 3. Refer to data sheet for more detailed information, or consult Sika for other primer options.
 4. Premix both components. Sikalastic MT Primer, Part "A" is red in color. Sikalastic MT Primer, Part "B" is light amber in color.
 5. Add the 1.5 gallon of Sikalastic MT Primer, Part "B" to the 3 gallons of Part "A" in the short filled Part "A" pail. Mix thoroughly with a mechanical mixer (Jiffy) for 3 minutes.
 6. This mixture will appear as a red transparent color.
 7. Allow primer to cure a minimum of 12 hours at 70°F and 50% RH or until tack free before applying second primer or base coat.
- C. Metal: Consult manufacturer for selection of primer.

3.4 DETAILING

- A. Non-Structural Cracks up to 1/16 inch wide (maximum): Apply a detail coat of Sikalastic 720 Base at 23 mils wet, 4 inches wide, centered over the crack. Allow to become tack free before overcoating.
- B. Cracks and Joints over 1/16 inch up to 1 inch: Rout and seal with sealant and allow to skin over and cure. Apply a detail coat of Sikalastic 720 Base at 23 mils wet, 4 inches wide, centered over crack. Allow to become tack free before overcoating.
- C. Joints over 1 inch: Treat as expansion joints and brought up through the Sikalastic Traffic System and sealed with sealant.

3.5 BASE COAT

- A. Sikalastic 720 Base:
 - 1. Premix Sikalastic 720 Base Part A and Part B using a mechanical mixer (Jiffy) at slow speeds to obtain uniform color, making sure to scrape the solids from the bottom and sides of the pails. Do not break down kits into smaller quantities; portions are premeasured.
 - 2. Pour Part B into Part A slowly and while mixing, and scrape the sides of the container. Mix the combined materials thoroughly until a homogenous mixture and uniform color is obtained (typically 3 minutes). Use care not to allow the entrapment of air into the mixture.
 - 3. Apply at the recommended coverage rate of 23 mils wet, using a 3/16" notched squeegee or trowel and backroll using a phenolic resin core roller. Extend base coat over entire area including previously detailed cracks and control joints.
 - 4. Allow coating to cure a minimum of 3-4 hours at 70°F and 50% RH; base coat must be tack free before overcoating.

3.6 BINDER COAT

- A. Sikadur 22 Lo-Mod:
 - 1. Premix Sikadur 22 Lo-Mod Part A and Part B using a mechanical mixer (Jiffy) at slow speeds to obtain uniform color, making sure to scrape the solids from the bottom and sides of the pails. Do not break down kits into smaller quantities; portions are premeasured.
 - 2. Pour Part B into Part A slowly and while mixing, and scrape the sides of the container. Mix the combined materials thoroughly until a homogenous mixture and uniform color is obtained (typically 3 minutes). Use care not to allow the entrapment of air into the mixture.
 - 3. Apply at the required application rate using a 3/16" or 1/4" notched squeegee and backroll using a phenolic resin core roller. Application rate is 20 mils wet for medium vehicular traffic applications, and 32 mils wet for both heavy and extra heavy vehicular traffic applications.

4. For extra heavy vehicular traffic applications only, an additional 32 mil wet application of Sikadur 22 Lo-Mod and full aggregate broadcast is required.
5. Apply aggregate 1.25 – 1.5 lbs. per sf into the wet coating. Slowly broadcast so the aggregate falls vertically into the binder making several passes, allow the binder to bleed through the sand before making the next pass. Cover completely before binder becomes tack free. Allow coating to cure a minimum of 8 hours at 70 degrees F and 50% RH or until tack free between coats. Remove all loose aggregate before top coating or opening to traffic. Allow a minimum of 32 hours before opening to vehicular traffic.

3.7 TOP COAT

- A. Sikalastic 745 AL Top:
 1. Premix Sikalastic 745 AL Top Part A and Part B using a mechanical mixer (Jiffy) at slow speeds to obtain uniform color, making sure to scrape the solids from the bottom and sides of the pails. Do not break down kits into smaller quantities; portions are premeasured.
 2. Pour Part B into Part A slowly and while mixing, and scrape the sides of the container. Mix the combined materials thoroughly until a homogenous mixture and uniform color is obtained (typically 3 minutes). Use care not to allow the entrapment of air into the mixture.
 3. For heavy vehicular traffic applications only, apply at 14 mils wet, using a 3/16" notched squeegee and backroll using a phenolic resin core roller. Apply aggregate evenly seeded and distributed at 10-15 lbs. per 100 sf into the wet coating. Allow coating to cure a minimum of 3-4 hours at 70 degrees F and 50% RH or until tack free between coats.

3.8 CLEANING

- A. Remove uncured materials from tools or other surfaces with an approved solvent. Remove cured materials can by mechanical means.
- B. Remove any material spatters and other material that is not where it is specified to be applied. Remove masking and covers, taking care not to contaminate surrounding areas.
- C. Repair any damage that should arise from either the application effort or from the clean-up effort.
- D. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

I:\837920\02 Design\specs\837920 07 18 00 Vehicular Traffic Coatings.docx

This Page Intentionally Left Blank.

METAL WALL PANELS

SECTION 07 42 13

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all sections within Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 07 53 00 – Elastomeric Roofing and Flashing

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good roofing practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

- A. The Contractor shall provide all scaffolding, lifts, cranes, and equipment necessary to perform the work.
- B. The Contractor is to coordinate work within this section with all other associated trades to perform work in an orderly fashion and to minimize temporary supports and weather protection.
- C. Install air barrier, plywood, metal wall panels, closure panels, blind nailers, and associated flashings where indicated in the Contract Drawings.
- D. Install flashings to properly terminate roof membrane at metal panel locations. Coordinate with Section 07 53 00 – Elastomeric Roofing and Flashing.
- E. Metal panels are to have staggered seams and are to be centered along wall runs.
- F. Install blind nailers at limits of wall cladding.
- G. Install backer rod and sealant at locations indicated on Contract Drawings.
- H. Clean and restore all areas affected by the work.

1.4 QUALITY ASSURANCE

Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance for a minimum of 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.
- B. Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Field cutting sheet metal by torch is not permitted. All field cuts shall be de-burred.
- E. Immediately remove all strippable films from panel surfaces if exposed in direct sunlight.

1.6 PROJECT CONDITIONS

- A. Verify locations of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.7 WARRANTY/GUARANTEES

- A. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- B. Finish Warranty Period: 15 years from date of Substantial Completion.
- C. Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 - MATERIALS

2.1 METAL PANELS AND PRE-FORMED FLASHINGS

- A. Aluminum for construction of all sheet metal wall panels, closures, corners and associated flashings shall be of 3004 aluminum alloy, H36 temper or equivalent, 0.040" and 0.050" thick factory painted aluminum. Wall panels to be manufactured by ATAS International, Designer Series by MBCI or CF Architectural Vertical Wall Panel by Metlspan or approved equal. Finish for all exposed painted aluminum flashings shall be as described in paragraph 2.6 of this Section.
- B. Exterior wall panels shall have one 12" wide (visible surface) raised rib with a minimum depth of 1". Panels shall have interlocking side laps to conceal securements.
- C. Termination bars shall be 1/8" x 1" aluminum bar with pre-punched holes at 8" on center.
- D. All accessories, including but not limited to nails, screws and clip strips shall be aluminum, stainless steel or galvanized steel and completely compatible with the surrounding metal to prevent galvanic reaction.
- E. Rivets shall be 3/16" diameter aluminum or stainless steel as required by the metal being fastened.
- F. Attachment system components shall be formed from extruded aluminum and include manufacturer's standard perimeter extrusions, panel stiffeners, panel clips and anchor channels.
- G. Sheet metal panel, closures, corners and flashings shall be shop fabricated. All breaks, bends and hems shall be uniform, clean, straight lines.
 - 1. Inside and outside corners shall be 4" wide (visible surface)
 - 2. Drips shall be hemmed 3/4" wide and break at a 30° angle.
 - 3. Clips shall be 2" wide.
 - 4. All flashing joints shall have 6" wide cover and backer plates.
Fabrication Schedule:
 - a. Aluminum, painted finish (.050)
 - 1) Wall Panels
 - 2) Clips
 - 3) Inside Corners
 - 4) Outside Corners
 - 5) Jamb Closure
 - b. Aluminum, painted finish (.040)
 - 1) Cover Plates
 - 2) Blind Nailers
 - 3) Drip Edge

- c. Aluminum mill finish (.050)
 - 1) Continuous Hook strip
 - 2) Cleat

2.2 FASTENERS

- A. In general, fasteners, straps and other hardware shall be stainless steel or hot-dip galvanized steel. Galvanizing shall be per ASTM A 153 specifications. Electro-galvanizing will not be accepted.
- B. Fasteners for securement of flashings and hook strips to concrete or masonry shall be ¼-inch diameter hammer drive anchors with zinc sheaths and flat heads such as Zamac Nailins by Rawl, Star Fasteners, Unifast, or approved equal. Anchors shall be of sufficient length to penetrate the substrate 1-1/4-inch minimum.
- C. Fasteners for securement of flashings to metal stud walls shall be No. 12 self-drilling, self-tapping screws with flat heads. Screws shall be of sufficient length to penetrate the metal studs 5/8" to 1".
- D. Fasteners for securing subgirts and sheet metal to masonry: 1/4-inch diameter, 2-inch long stainless steel masonry screws or 1/4-inch diameter, 2-inch long drive pins. Drive pins shall have lead sheaths and stainless steel pins.
- E. Fasteners for securing wall panels, closures, metal flashings and metal trim to metal subgirts or plywood substrates: #12-24, sheet metal screws, pan head, stainless steel 3/4-inch long.

2.3 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Hat or "Z"-shaped Subgirts or Channels:
 - a. Nominal thickness: 22 gauge minimum
 - b. Depth: 1-1/2" or as required

2.4 AIR BARRIERS AND ACCESSORIES

- A. Provide self-adhered, vapor-permeable sheet membrane air barrier and accessory products from a single manufacturer. Provide high temperature air barrier membrane(s) when subject to higher temperatures behind metal flashings and wall components. Subject to compliance with the requirements of this Section, the following manufacturers are acceptable:
 - 1. Henry Products, Inc.:
 - a. Air Barrier Membrane: Blueskin VP™ 160.

- b. Accessories: membrane for windowsill pan flashings shall be Blueskin® SA, LT, or HT manufactured by Henry; an SBS modified bitumen, self-adhering sheet membrane which is integrally laminated to a blue polyethylene film.
 - c. Self-adhering membrane for all window jambs, headers, inside and outside corners, and other transitions shall be pre-cut BlueskinVP™ 160 manufactured by Henry; a self-adhering sheet air barrier membrane with an engineered film specifically designed to be water resistant and vapor permeable.
 - d. Through-wall flashing membrane (Self-Adhering) shall be Blueskin® TWF manufactured by Henry; an SBS modified bitumen, self-adhering (Yellow) sheet membrane complete with a cross-laminated polyethylene film.
- 2. Grace Construction Products:
 - a. Air Barrier Membrane: Perm-A-Barrier VPS.
 - b. Water-Based Primer: Perm-A-Barrier WB Primer.
 - c. Solvent-Based primer: Bituthene Primer B-2
 - d. Transition and Detail Membrane: Perm-A-Barrier Flashing.
 - e. Mastics, Adhesives and Tapes: as recommended by manufacturer.
- 3. VaproShield:
 - a. Air Barrier Membrane: WrapShield SA.
 - b. Window flashing: VaproLiqui-Flash
 - c. Solvent-based Primer:
 - d. Transition Membrane: VaproFlashing
 - e. Mastics, Adhesives and Tapes: As recommended by manufacturer.
- B. Joint Sealant: Shall conform to ASTM C 920 Type 1 or 2, single-component, neutral-curing silicone; Grade NS, Use NT, O. Class as recommended by air barrier manufacturer (low modulus).
- C. Spray Foam Insulation for filling voids and joints; single component, closed cell spray polyurethane, class 1, low expansive foam (Class A). Approved by Manufacturer for compatibility with air barrier products and accessories.
- D. Pre-formed Foam Joint Sealant: Manufacturer's standard pre-formed, pre-compressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb./cu. ft. and impregnated with a non-drying, water-repellent agent. Factory produce in pre-compressed sizes in roll or stick form to fit joints widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
 - 1. Products: subject to compliance with requirements, provide the following:
 - a. EMSEAL Joint System, Ltd.; Colorseal or approved equal.

2.5 SEALANT AND ACCESSORIES

- A. Exterior sealant shall be two-part polyurethane base conforming to ASTM C920, Type M, Grade NS, Class 25, uses NT, M, A and O as manufactured by Tremco, Sonneborne or Pecora. Color shall match the metal panel color.

- B. Sealant required for incidental sheet metal and flashing work where sealant will not be exposed, shall be one part acrylic conforming to Fed. Spec. TT-S-230 such as "Mono" by Tremco or approved equal.
- C. Cleaners and primers shall be as recommended by the manufacturer of the sealant.
- D. Bond breaker tape shall be self-adhesive polyethylene tape as recommended by the sealant manufacturer.
- E. Backer rod shall be continuous length, closed cell polyethylene foam, as recommended by the sealant manufacturer. Backer rod shall be compressible, resilient, non-waxing, non-extruding and non-staining. Backer rod shall be of sufficient size to be compressed 30% of maximum joint width and shall be totally compatible with the sealant, primer and substrates. Backers shall conform to the requirements of ASTM C 962 - Type A, ASTM D 1622, ASTM D 1623 and ASTM D 5249 such as Green Rod by Nomaco, Sonofoam by Sonneborn, ITP soft type backer rod or approved equal.

2.6 FINISH

- A. Finish for all exposed aluminum surfaces shall be a Resin-Based Coating- Hylar 5000, or Kynar 500. Paint dry film thickness shall be not less than 1.0 mils +/- 0.2 mils. Surface preparation and coating shall conform to AAMA 2605 Specifications. Durability: Provide coating field tested under normal range of weather conditions for a minimum of 15 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.
- B. Aluminum color shall be selected by the Owner.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide subgirts or hat channels to properly support metal wall panels.
- B. Examine substrates and conditions for compliance with requirements indicated for conditions affecting performance of metal panel walls.
- C. Do not proceed with wall panel installation until unsatisfactory conditions have been corrected.
- D. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

- E. Securely anchor wall system, with panels free of distortion, free of surface imperfections, and uniform in color.

3.2 SHEET AIR BARRIER MEMBRANE INSTALLATION

- A. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout or Polyurethane Foam.
- B. Treat sheathing joints with any method below:
 - 1. Mesh Tape centered over joint and adhered to surface, with Product filling joint and covering Mesh Tape.
 - 2. Four-inch width DCH Reinforcing Fabric encapsulated in Product and centered over joint.
 - 3. Fill with Joint Sealant and strike flush.
- C. Prepare areas to receive Transition Membrane with Contact Adhesive. Contact Adhesive shall be provided at recommended coverage rate and visible for 1-inch minimum beyond edge of installed Transition Membrane.
- D. Install Transition Membrane according to Manufacturer's instructions and drawings.
- E. Apply Transition Membrane or Reinforcing Fabric encapsulated in Roller-Grade Product according to Manufacturer's instructions and drawings in the following areas: Joints, changes in plane, changes in substrate, window openings, and transitions to different systems.
- F. Transition membrane or Reinforcing Fabric shall bear 3 inches minimum onto dissimilar substrates.
- G. Allow materials used in surface preparation to cure fully before applying Product.
- H. Apply Product according to Manufacturer's instructions.
- I. Apply over sheathing joint details.
- J. Provide complete coverage without fishmouths, wrinkles or tears.
- K. Seal penetrations made through installed Product according to Manufacturer's instructions and drawings.
- L. Fenestration installed before or after Product: provide air and water seal between fenestration and opaque wall according to Manufacturer's instructions and drawings.
- M. Roof vapor barrier: Join to Product according to Manufacturer's instructions and drawings.

3.3 PANEL INSTALLATION

- A. Prior to performing panel installation ensure that all mechanical/electrical disconnections have been performed in accordance with the Owners requirements.
- B. Install subgirts or hat channels perpendicular to direction of wall panels. Space subgirts at not more than 24-inches on center. Secure subgirts with specified fasteners spaced at 16-inches on center, maximum.
- C. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement. Secure panels to the CMU and stud wall with the specified fasteners through the folded leg of the panel sheet at each subgirt location.
- D. Provide full bed of sealant in the fold of the metal panel prior to inserting the flange of the corresponding sheet. Sealant shall run the full height of the vertical panel. Provide drops of sealant at all fasteners heads.
- E. Install all components required for a complete wall panel assembly including pan flashings, sill flashings, trim, inside and outside corner units, clips, cleats, flashings and similar items as required.
- F. Backer plates shall be installed at the splice of all horizontal flashings. Set flashing over backer plate in a full bed of sealant. Install cover plates at each flashing joint with a full bed of sealant flashing and cover plate surfaces.
- G. Shim and align panel units within installed tolerance of 1/4 inch in 20 feet on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. Panel shall be installed in a manner that will allow for thermal movement without deforming the face of the panel or adjacent panels and trim. The open edges of panel seams shall face away from main entrances or prominent elevations.
- H. To make a cut parallel to the ribs, score the panel deeply with a sharp utility knife and bend back-and-forth along the score, breaking the metal off cleanly. For cuts across the ribs, use straight-cut snips, electric or pneumatic shears, a portable profile shear, or an electric nibbler. Circular saw cutting may be performed with a metal cutting blade (a finetooth hardwood blade, or a standard combination blade reversed in the saw). Light oil or soap on the blade should be added to aid cutting.

3.4 COUNTERFLASHING INSTALLATION

- A. Fabricate new counterflashing to the dimensions and shapes shown on the Contract Drawings and as specified herein.

- B. Secure counter flashing with the membrane flashing with termination bars secured at 8" on center.
- C. Secure the counterflashings with clips spaced 8" on center

3.5 SEALANT INSTALLATION

- A. Install sealant at all window perimeters of wall areas receiving new metal wall panels. Perimeter sealants are to be installed at wood and aluminum window frames.
- B. Clean and prime substrates in strict accordance with sealant manufacturer's requirements.
- C. Precondition sealants to a temperature between 60 and 70 degrees or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between 60- and 85-degrees F.
- D. Ensure all work by others occurring at sealant joint locations has been completed prior to the start of sealant installation.
- E. Clean all substrates to receive the joint sealant using the manufacturers recommended cleaners and surface preparation techniques.
- F. Ensure all existing sealants and other materials have been removed down to clean sound original substrates. Saw-cut, wire brush, chip, or grind as required to achieve suitable substrates for sealant installation.
- G. All bonding surfaces shall be cleaned with a minimum of two applications of solvent followed by wiping with clean white rags. Solvent shall be applied with brushes and wiped from substrate with rags while it is still wet. Additional application shall be performed if dirt remains after two applications until all dirt is removed.
- H. Joint primer shall be applied to all properly prepared, cleaned and dry substrates. Primer shall be approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.
- I. Primer shall be applied prior to application of joint backer, bond breaker or sealant.
- J. Joint backer shall be installed in all joints as detailed. Joint backing shall be installed with approximately 30% compression at 70 degrees F. Do not stretch, twist, tear or puncture joint backing. Butt joint backings tightly at intersections.
- K. Joint backing shall be installed at the required depth so as not to exceed the joint width/depth ratio recommended for the sealant.

- L. Bond breaker tape shall be installed at locations where backer rod cannot be utilized to achieve the designated joint depth and where shown on the Contract Drawings. Sealant shall adhere only to the sides of the joint and not to the back so as to eliminate three- sided adhesion.
- M. Two-part polyurethane sealant shall be thoroughly mixed including tinting agent in accordance with the manufacturer's printed instructions. Sealant shall have a minimum application life of three (3) hours after mixing.
- N. Unless otherwise required by the sealant manufacturer, the sealant shall be mixed for a period of 6 minutes minimum with a slow speed electrical drill and mixing paddle. The sides of the container shall be repeatedly scraped to ensure adequate mixing.
- O. Sealant shall be applied to clean, dry, joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.
- P. Sealant shall be forced into the joint to completely fill the void and achieve full "wet-out" of the bonding surfaces. Force sealant into the joint and against the sides of the joint. Avoid pulling sealant from sides. All joint sealant shall be immediately tooled to assure full adhesion. Sealant shall be dry tooled, straight, uniform, smooth and neatly finished to the profiles detailed. No soaps, wetting of slicking agents will be allowed.
- Q. Provide weep holes at sill locations spaced 24" on center.

3.6 BLIND NAILER

- A. Fabricate and install blind nailer flashing with a 2" minimum leg inserted behind the metal. Fasten flashing through leg of blind nailer.
- B. Fold blind nailer with ½" hemmed edge over metal and fastener.
- C. Provide continuous beads of sealant at back and leading edges. Refer to the detail for additional information.

3.7 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures. Repaired panels must be accepted by the Owner.

- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

I:\837920\02 Design\specs\837920 07 42 13 Metal Wall Panels.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

ROOFING AND FLASHING FILED SUB-BID REQUIREMENTS

SECTION 07 50 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Roofing Work" include all of the following listed Specification Sections in their entirety.

SECTION 07 53 00 - ELASTOMERIC ROOFING AND FLASHING
SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

- D. The Work of this section is shown on Drawings

A101, A206, A211, A212, A213, A214, A501, A502, A503

E. SUB-SUBS

- 1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\837920 07 50 00 Roofing and Flashing (Filed Sub-Bid).docx

ELASTOMERIC ROOFING AND FLASHING

SECTION 07 53 00

(Filed Sub-Bid with Section 07 50 00)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all sections within Division 1 for additional information.

1.2 SCOPE OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice and as required by the material manufacturer, as amended. The work under this Section generally includes the following:
 - 1. Coordinate this work with all other trades to provide orderly progress of work.
 - 2. Supply all shoring and protection necessary to protect the building areas, building systems and landscape areas.
 - 3. Coordinate the disconnection, removal, relocation, and reinstallation of mechanical units, conduits, ductwork, equipment, etc.
 - 4. Supply all necessary chutes, disposal facilities, transportation and labor necessary to dispose of all demolished materials, dirt, and debris off-site in a legal dumping area. The Contractor shall obtain all permits necessary to transport and dispose of all materials, rubbish and debris.
 - 5. Remove and dispose of existing roofing materials, including but not limited, to roof membrane, membrane flashings, sheet metal flashings, insulations and associated components down to the existing asphaltic coating and concrete deck to remain. Prepare surfaces to receive new roofing assembly.
 - 6. Remove all existing base flashings. Remove other existing flashings such as unit curbs, pitch pockets, sheet metals, and other components as required to properly complete the work.
 - 7. Clear roof surfaces of debris by sweeping and vacuuming methods as required to remove all debris from the metal roof deck surface.
 - 8. Remove, protect and/or store all materials and assemblies to be reinstalled.
 - 9. Install wood blocking and plywood sheathing as required to provide a minimum 8-inch flashing height and properly terminate the roof membrane and flashings as indicated on the Contract Drawings.

10. Furnish and install a new adhered single-ply elastomeric roofing assembly including, but not limited to, elastomeric membrane, coverboard, and mechanically attached tapered insulation, over existing roof deck at the George A. Ayotte Garage as indicated on the Contract Drawings.
11. Furnish and install a new adhered single-ply elastomeric roofing assembly over existing roof deck at the Joseph M. Downes Garage as indicated on the Contract Drawings.
12. Install tapered insulation as indicated on the Contract Documents and as required to shed water toward the drainage systems.
13. Install expansion joints at locations as indicated in the Contract Documents.
14. Install sheet metal flashings, including but not limited to, edge metals, counter flashings, skirt flashings, hook strips and clips to properly terminate the roofing membrane and shed water from walls and mechanical units.
15. Install overflow scuppers at the brick masonry rising walls at the George A. Ayotte Garage where indicated on the Contract Drawings.
16. Clean and restore all areas affected by the work to the satisfaction of the Owner.

1.3 SPECIAL JOB CONDITIONS

- A. Schedule and execute all work without exposing the building interiors to inclement weather. Protect all new and existing roof work, the building, and its contents from staining and damages. Segregate all work areas from the building occupants.
- B. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.
- C. The building shall be occupied during construction. The Contractor shall provide all protection, barriers, and guards necessary to segregate their work area, and the areas below, from pedestrian and vehicular traffic. Also protect existing roof areas, equipment, landscaping, and paved areas from damage.
- D. All surfaces to receive new insulation, membrane or flashings shall be thoroughly dry. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surface prior to application. No open flames shall be permitted on the roof at any time.
- E. Remove only as much existing roofing as can be replaced and made weather tight each day, including all flashing work.
- F. Roofing shall not be applied when ambient temperature is less than 40 degrees F unless approved in writing by the Engineer and membrane manufacturer.
- G. Temporary waterstops shall be installed at the end of each day's work and shall be removed before proceeding with the next day's work. Waterstops shall be compatible with all materials and shall not emit dangerous or incompatible fumes. Waterstops

must be installed to permit proper roof drainage. Waterstops shall not be installed to impede roof surface drainage.

- H. Cover sidewall areas with canvas tarps where existing roof system is discarded into refuse containers via trash chutes. Plastic or "poly" tarps shall not be used at these locations.
- I. All new and temporary construction, including equipment and accessories, shall be secured from wind damage or blow-off.
- J. Equipment required to hoist materials to the roof and remove debris from the roof shall be supplied, maintained, and operated by the Contractor.
- K. The Contractor shall provide protection for sitework, plantings, landscaping, building surfaces, interior spaces, and similar items to protect from damage. Items damaged as a result of the work in this section shall be repaired or replaced by the Contractor to the satisfaction of and at no additional cost to the Owner.
- L. The Contractor shall clean all debris which may infiltrate through the roof decking into the interior prior to demobilization from the site. This shall include, but not be limited to, floors, cabinets, and drop ceilings.
- M. The Contractor shall notify the Owner at least 72 hours in advance of doing any interior demolition work so that the Owner may provide entry into required areas.
- N. No removal, replacement, repair or covering of potentially deteriorated roof deck shall be performed without authorization from both the Engineer and Owner.
- O. The Contractor is cautioned to take all necessary precautions and make all investigations necessary to install the work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.4 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.
- B. A sample roofing system warrantee and letter of confirmation from the roof membrane manufacturer stating that the Contract Documents have been reviewed and that there are no exceptions to the Specifications and Contract Drawings shall be submitted. The roofing system must meet the intent of UL 790, Class A and shall meet the intent of Factory Mutual Class 1-120 and be in conformance with all local and state building codes, and is accepted by the manufacturer for the required warranty.

- C. The Contractor shall provide adequate staging and protection of the interior building as required to perform the work. Provide submittals for site protection and staging as specified in Section 01 33 00 – Shop Drawings and Submittals.
- D. Provide a letter of approval from the insulation manufacturer and membrane manufacturer that the proposed insulation system is compatible with the cold adhesive system and will achieve the specified warranty.
- E. Provide the manufacturer's product and installation literature for each item listed in Part 2 for approval. Shop drawings are required indicating any anticipated changes.
- F. Submit a full-size (24" x 36") roof area plan showing proposed flat stock, tapered, and cricket insulation layout and attachment requirements with slopes to drains and scuppers/downspouts.
- G. Provide attachment layout and spacing for cricket insulation layout. Contractor to confirm adhesion testing during the roof renovations to meet the intent of **FM Global 1-120** system requirements.
- H. Submit evidence that the cold adhesive manufacturer's representative had observed the insulation installation and that the system appears to be installed in accordance with the manufacturer's instructions.

1.5 QUALITY CONTROL

A. Roofing Contractor's Experience Requirements:

The Roofing Contractor shall be experienced, to the satisfaction of the Owner and Engineer, in the installation of warranted, cold-process, multiple-ply, roofing systems. Minimum required experience involves the successful installation of at least five (5) projects of similar scope, size and complexity where the Roofing Contractor has installed the Manufacturer's cold-process, modified-bitumen roofing assemblies, within the past three (3) years. All such references must be available for inspection by the Owner and Engineer, as may be requested. Provide the following submittal information:

- 1. Name, address and contact person of each of the five (5) projects being used as a reference.
- 2. Copies of Roofing Material Manufacturer's warranties, showing dates and square footage for each of the five (5) referenced projects.
- 3. Written letter of "Certification" or "Approval" from the Roofing Materials Manufacturer showing that the Roofing Contractor has been "Certified" or "Approved" by the Roofing Materials Manufacturer for a minimum of three (3) years.

1.6 TESTING PROCEDURES

- A. During the course of the work, the Owner (or designated representative) may secure samples, in accordance with testing guidelines defined within ASTM D140, of materials and completed roofing being installed at the job site and submit them to an independent laboratory for comparison to the material performance requirements listed in these specifications.
- B. Should test results prove that materials and/or completed roofing do not meet-or – exceed the performance requirements listed within these specifications:
 - 1. Contractor shall pay for all testing.
 - 2. Construction installed and found not to comply with the specifications shall be removed and replaced at no change to the contract price.

1.7 MOCK-UP TEST AREAS

- A. Before full scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture, and appearance match with the existing construction. Test areas will be at locations established by the Owner.
 - 1. Two linear feet (2 LF) of each roof edge metal configuration.
- B. Trial areas shall be repeated until acceptable results are obtained, and the accepted areas shall be a standard for all subsequent work. Construction of test areas shall be in conformance with all Contract Documents and shall use only submitted materials.
- C. Each mock-up shall be a minimum of two feet by two feet (2' x 2') where applicable and shall include all components of the roofing system.

1.8 WARRANTY AND GUARANTEE

- A. Roofing Contractor's Guarantee: Upon completion of the work, and prior to final payment, the Contractor shall submit a Guarantee of his work to be free from defect in materials and workmanship. This Guarantee shall be for a period of two (2) years, and shall be signed by a Principal of the Contractor's firm, and sealed if a corporation. In the event any work related to the roofing, flashing, or metal work is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost to the Owner. The roofing Contractor's warranty obligation shall run directly to the building Owner, and a copy of the roofing signed warranty shall be sent to the roofing system's manufacturer.
 - 1. The duration of the Roofing Contractor's two-year warranty shall run concurrent with the roofing system's manufacturer's 20-year warranty.
- B. Roofing Systems Manufacturer's Warranty: The roofing manufacturer shall guarantee roof areas to be in a watertight condition and free from seam separation and the delamination of the roofing system components, for a period of 20 years,

from the date of final acceptance of the roofing system. The warranty shall be a 20-year no dollar limit, non-prorated total system labor, and material warranty, for wind speeds up to 75 miles per hour. The total system warranty shall include all roofing materials, related components, and accessories including, but not limited to the baseboard, vapor retarder, insulation board, cover board, roofing membrane, membrane flashings, fasteners, adhesives and termination metals and roof drain assemblies. The manufacturer shall repair leaks and defects, in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 – MATERIALS

2.1 ROOFING AND FLASHING MEMBRANES

- A. Roofing membrane shall be 0.060 mil thick non-reinforced compounded rubber sheet elastomer (EPDM), as manufactured by Firestone, Carlisle SynTec Systems, Inc., or Versico Incorporated or approved equal.
- B. Stripping shall be 6" or 9" wide semi-cured EPDM self-adhering seam cover strips (minimum thickness: 60 mils.) as manufactured by Carlisle SynTec Systems, Inc., Firestone or Versico Incorporated.
- C. The elastomeric sheet membrane shall have the following minimum properties:

| PHYSICAL PROPERTY | TEST METHOD | SPECIFICATIONS |
|--|------------------------|-----------------------|
| Tolerance on Nominal Thickness, % | ASTM D 412 | +/- 10 |
| Tensile Strength, min, psi | ASTM D 412 | 1600 |
| Elongation, Ultimate, min, % | ASTM D 412 | 465 |
| Tear Resistance, min, lbs./in | ASTM D 624 (Die C) | 200 |
| Factory Seam Strength, min | Modified ASTM D 816 | Membrane Rupture |
| PHYSICAL PROPERTY | TEST METHOD | SPECIFICATIONS |
| Resistance to Heat Aging Properties after 4 weeks @ 240°F | | |
| Tensile Strength, min, psi | ASTM D 412 | 1450 |
| Elongation, Ultimate, min, % | ASTM D 412 | 280 |
| Tear Resistance, min, lb./in | ASTM D 624 | 215 |
| Linear Dimensional Change, max, % | ASTM D 1204 | -0.5 |
| Ozone Resistance | ASTM D 1149 | No Cracks |

| PHYSICAL PROPERTY | TEST METHOD | SPECIFICATIONS |
|---|------------------------------|--------------------------|
| Condition after exposure to 100 pphm Ozone in air for 168 hours @ 104°F (40°C) Specimen is at 50% strain | | |
| Brittleness Temp., max deg. F | ASTM D 746 | -49 |
| Resistance to Water Absorption After 7 days immersion @ 158°F (70°C) Change in mass, max % | ASTM D 471 | 2.0 |
| Water Vapor Permeability max, perm-mils | ASTM E 96 (Proc. B or BW) | 0.03 |
| Resistance to Outdoor (Ultraviolet) Weathering Xenon-Arc, 4000 hours exposure, 176°F (80°C) black panel temperature | ASTM D 26 | No Cracks No Cracking |
| Sheet Composition Weight percent of polymer that is EPDM, min, % Weight percent of sheet that is EPDM polymer, min, % | ASTM D 297 | 100 30 |

- D. Factory fabricated membrane seams shall be step tapered to achieve a smooth transition across the seam. Seams shall be vulcanized.
- E. Flashing membrane to be used at corners of walls or penetrations shall be of the same manufacturer as the roof membrane and shall be 0.060" thick uncured elastomer completely compatible with all other components used in the new roofing system. Cured membrane specified in 2.1B shall be used at straight flashing runs. Seams shall be stripped-in with uncured membrane.
- F. All materials and accessories used to install the roofing and flashing membrane systems shall be of the same manufacturer as the sheet membrane. These materials include, but are not limited to, the following:
1. Surface cleaners and primers
 2. Bonding adhesive
 3. Splicing cement
 4. Lap Sealant
 5. Mastics
 6. Caulkings and sealants
 7. Pourable sealer
 8. Pipe seals
 9. Walkway Pad
 10. Membrane termination strips, bars, plates and fasteners.

- G. All membrane manufacturer's required details shall be considered a part of this project and incorporated into the project details by the Contractor.

2.2 ROOF INSULATION

- A. All roof insulations proposed for this project shall be approved in writing by the membrane manufacturer for use with their membrane and as required to achieve the required roofing warranty.
- B. Tapered and flat stock isocyanurate insulation shall be skinned with factory-applied fiberglass bituminous felt as manufactured by Celotex, Johns Manville, Firestone, or as supplied by the membrane manufacturer as required to meet membrane manufacturer's requirements and warranty. The isocyanurate insulation board shall conform to ASTM Specification C 1289, Type II, Class 1, Grade 3 (25 psi minimum).
1. Tapered insulation shall be as required to provide a minimum 1/4" per foot slope to drainage system, and 1/2" per foot at crickets, drain sumps and around mechanical rooftop units; and meet the required LTTR value in accordance with ASTM C518 as described above.
 2. The isocyanurate insulation board size shall be a min of 2'x2' if close to roof edge or 4'x4' if located in field of roof square and of uniform dimension.
 3. Isocyanurate insulation shall be approved in writing by the insulation and membrane manufacturer that the methods of attachment are covered under the membrane manufacturer's labor and material warranty. Copies of the written acceptance shall be forwarded to the Engineer.
- C. Tapered edge strips:
1. Tapered edge strips shall be 18" wide and 1-5/8" thick, tapering to a feathered edge.
 2. Tapered edge strips shall consist of either wood fiberboard or isocyanurate insulation.
 - a. Wood fiberboard shall be high density, non-asphalt impregnated and conform to ASTM C208 specifications.
 - b. Isocyanurate insulation tapered edge strips shall meet ASTM C1289, Type II, Class 1, Grade 3 specifications.
 3. Fiberboard insulation shall be approved in writing by the membrane manufacturer. A copy of the written acceptance shall be forwarded to the Engineer.

2.3 COVERBOARD

- A. Coverboard insulation shall be 1/2" minimum thick high density isocyanurate insulation board as required by the roofing manufacturer. The boards shall be a maximum of 4' x 4' in size and approved in writing by the membrane manufacturer. A copy of the written acceptance shall be forwarded to the Engineer. Coverboard insulation shall conform to ASTM C1289 Type II specifications. Compressive

strength shall be greater than 100 psi in accordance with ASTM D2126. Water absorption shall be 3.0% or less in accordance with ASTM C209.

2.4 COLD ADHESIVE FOR COVERBOARD SECUREMENT

- A. Adhesive to adhere the cover board systems shall be considered low volatile compounds (VOC), two component, cold-process, asbestos free, low-rise polyurethane foam adhesive conforming to ASTM D276, D2556, D1875, D429, D816, D1876, D412. Adhesive shall meet the intent of the FM Global rating and shall be approved in writing by the membrane manufacturer and included as part of the warranty coverage. Adhesive shall be I.S.O. stick as manufactured by Firestone, Insta-Stik Professional Roofing Adhesive as manufactured by Insta-Foam Products, Inc., Olybond by Olympic or an approved equal.

2.5 FASTENERS AND ACCESSORIES

- A. In general, fasteners, straps and other hardware shall be copper, brass, stainless steel or hot-dip galvanized steel. Galvanizing shall be per ASTM A 153-82 specifications.
- B. All accessories, including, but not limited to nails, screws, clips, fastening strips, etc. shall be completely compatible with the material being fastened to prevent galvanic reaction and premature deterioration.
- C. Nails for membrane and flashing terminations shall be No. 12 Stubbs gauge, large head, threaded shank, hot dip galvanized roofing nails of sufficient length to penetrate the wood blocking 1-1/4" minimum
- D. Fasteners for terminating roof membrane and flashing at concrete or masonry substrates shall be minimum 1-1/2" long drive pins in zinc sheaths as manufactured by Star, Rawl or approved equal. Embedment into masonry shall be 1-1/4", minimum.
- E. Sheet metal to wood blocking connections and mechanical unit securement (exposed securement): Self-drilling, self-tapping, Number 10, stainless steel hex-head screws, 1-1/2-inch long, equipped with metal capped EPDM washers.
- F. Fasteners for securing wood blocking to wood blocking shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the receiving member 1 1/2-inch minimum, except full depth into plywood.
- G. Fasteners for securing wood blocking and plywood to steel shall be Number 12 minimum coated steel deck screws, with a minimum 1-inch embedment.

- H. Fasteners for securing wood blocking to concrete substrates shall be one-piece fluorocarbon coated, 1/4" diameter flat head anchors such as Rawl drives by the Rawl Plug Company or approved equal, with a minimum 2-inch' embedment into the substrate.
- I. Fasteners for securing plywood to concrete and masonry surfaces shall be 1/4-inch diameter hammer drive anchors with zinc-alloy sheaths and stainless-steel inserts as manufactured by Star Fasteners, Rawl, OMG or approved equal. Anchors shall be of sufficient length to penetrate the receiving substrate 1-1/4-inch minimum.
- J. Fasteners for securing wood blocking to CMU blocks and brick masonry units shall be Kwik-Con II+Torx Hex Screw Anchor as manufactured by Hilti or approved equal. Fasteners shall be of sufficient length to penetrate the receiving substrate 1-3/4" minimum.
- K. Fasteners for securement of flashings, and hook strips to wood blocking and plywood substrates shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the substrate 1-1/4" minimum, except full depth of plywood.
- L. Fasteners for securement of flashings and hook strips to concrete or masonry shall be 1/4-inch diameter hammer drive anchors with zinc sheaths and flat heads such as Zamac Nailins by Rawl, Star Fasteners, Unifast, or approved equal. Anchors shall be of sufficient length to penetrate the substrate 1-1/4-inch minimum.
- M. Nails for flashing securement at wood substrates shall be No. 12 Stubbs gauge, large head, threaded shank, copper, or galvanized steel nails minimum 1-inch long.
- N. Fastens for securement of the pre-engineered edge metal shall be recommended by the manufacturer.
- O. Fasteners to secure insulation boards to metal decking shall be minimum #12, self-drilling, self-tapping screws of sufficient length to penetrate the metal roof decking by 1-inch., with a fluorocarbon coating in conformance with FM 4470 specifications, installed through minimum 3-inches diameter (nominal), 26-gauge galvalume-coated steel stress plates, or as recommended by the insulation and membrane manufacturers.

2.6 DIMENSIONAL LUMBER

- A. All dimensional lumber for roofs and walls shall be construction grade Douglas Fir, Hem-Fir or Southern Yellow Pine, formed to the dimensions shown on the Detail Drawings and as required for proper installation of the new work. All new exterior perimeter woodwork, nailers, and wood blocking used on the building shall be minimum 6-inch wide, except where otherwise detailed. Wood furring/blocking

shall be permitted to be minimum 4-inch wide at expansion joints and wall locations.

- B. All woodwork shall have a maximum moisture content of 19% by weight on a dry weight basis. Kiln drying may be required to conform to maximum 19% moisture content.
- C. Pressure treated wood blocking/sleepers will only be permitted when wood furring or blocking is in direct contact with concrete, masonry, or exposed to the exterior.
- D. Shims for roof edge blocking shall be continuous cedar of the size required to provide a sloped surface for the roof edge detail as shown in the Contract Drawings.

2.7 PLYWOOD

- A. Plywood shall be APA Grade CD, Exterior, minimum ½-inch thick for wall systems, unless designated otherwise on the detail drawings. Pressure treated plywood will not be permitted.

2.8 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Rooftop equipment bases and support curbs.
 - 2. Blocking.
 - 3. Nailers.
 - 4. Treated wood for furring.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.9 SEALANTS AND ACCESSORIES

- A. Sealant for sheet metal flashings and other exposed locations shall be a one-part polyurethane conforming to ASTM C920-87, Type S, Grade NS, Class 25, Uses NT, M, A, and O such as manufactured by Tremco, BASF-Sonneborn, Sika Corp., or approved equal.
- B. Color(s) shall be selected by the Owner from the approved manufacturer's color chart. Colors shall be the manufacturer's available premium colors such as "Color Pak" by Tremco or approved equal.
- C. Primer shall be non-staining type as manufactured or recommended by the sealant manufacturer for each substrate.

- D. Substrate cleaner shall be non-corrosive and non-staining as recommended by the sealant manufacturer. Cleaner shall be totally compatible with the sealant for each substrate.
- E. Bond breaker tape shall be pressure-sensitive tape as recommended by the sealant manufacturer.
- F. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

2.10 EXPANSION JOINT

- A. Insulation for use at expansion joints shall be a fibrous, glass type batt, non-faced, roll insulation as manufactured by Owens-Corning Fiberglass or approved equal.
- B. Foam rod as required for expansion joints shall be a closed cell, high density, neoprene foam tube of the size required and as recommended by the membrane manufacturer.

2.11 SHEET METALS

- A. Aluminum shall be 0.032", 0.040", 0.050", and 0.063" thick Kynar 500 Fluoropolymer painted aluminum as shown on the Contract Drawings. Color(s) to be selected by the Owner. Aluminum shall have a mill finish for concealed items. Aluminum shall be 3003 alloy, H-14 temper.
- B. Pre-manufactured, Fascia System: Pre-formed, architectural metal edge system. Edge coping shall include:
 - 1. Basis of Design: Tremlock by Tremco or Paraguard by Siplast
 - 2. Tested per ANSI/SPRI ES-1 Standard to a design pressure of 290 lbs./ft² to comply with the International Building Code.
 - 3. Factory Mutual 1-150 (Zone 3 - Corner) approved for wind up lift protection.
 - 4. Color(s) to be selected by the Owner.
- C. All accessories, including but not limited to nails, screws and clips shall be stainless steel or galvanized steel and completely compatible with the surrounding metal to prevent galvanic reaction. Galvanizing shall be per ASTM A153-09.
- D. Termination bars shall be 1/8" x 1" stainless steel, copper, or aluminum bar (as required to prevent galvanic action with the flashings being secured) with pre-punched holes at 8-inches on center, or as required by the membrane manufacturer.
- E. Rivets shall be 3/16" diameter stainless steel as required by the metal being secured.

- F. Sheet metal flashings shall be shop fabricated. All breaks, bends, and hems shall be uniform, clean, straight lines.
1. All aluminum joints shall be adequately overlapped, back-sealed, and riveted.
 2. Flanges shall be 4" wide minimum.
 3. Drip edges shall be hemmed ¾-inch wide and break at a 30° angle.
 4. Clips shall be 2-inch wide.
 5. All flanges to be covered with roofing or flashing membranes shall have a ¼-inch minimum hem on the edge.
 6. All sheet metal joints shall have 6-inch-wide cover and backer plates.
 7. Blind nailers shall be 4-inch wide, folded to 2-inch-wide final dimension.
 8. Fascia reveals shall not exceed 8-inch. Fascia requiring a greater vertical face than 8-inch shall be fabricated as a two-piece system with each face of equal exposure.
 9. Maintain equal fascia height around entire perimeter of each roof area and where fascias abut.

2.12 MISCELLANEOUS METALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- E. Mastic for back-sealing sheet metal against non-metal substrates shall be as recommended by the underlayment manufacturer. Concealed sealant for back-sealing metal-to-metal connections shall be single-component, butyl (polyisobutylene) rubber sealant, heavy bodied for joints with limited movement.
- F. Self-Adhering Modified Bitumen shall be a 40-mil thick minimum with 4 mil, high-density polyethylene film and release paper backing formulated for high temperature installation in accordance with ASTM D 1970. such as Grace Ultra, Carlisle WIP 300HT, Henry Blueskin PE200HT, or approved equal.
- G. Slip sheet shall be 15-pound red rosin paper.

2.13 FABRICATION SCHEDULE

- A. Note, similar flashing components have been listed under multiple metal fabrications type and thicknesses. The Contractor shall coordinate the use of compatible metals to prevent galvanic corrosion and coordinate painted finish components at visible locations.
1. 0.032" Thick Coated Aluminum:
 - a. Blind Nailers
 2. 0.040" Thick Coated Aluminum:
 - a. Pre-Manufactured Coping/Edge Metal
 - b. Counterflashing
 - c. Skirt Flashing
 - d. Scuppers
 - e. Scupper Flashing
 - f. Fascia
 - g. Drip Edge
 - h. Jamb Flashing
 3. 0.050" Thick Coated Aluminum
 - a. Expansion Joint Cover
 4. 0.050" Thick Coated Aluminum:
 - a. 2-inch Wide Clips
 - b. Hook Strips
 - c. Cleats
 5. 0.063" Thick Coated, or Mill Finished Aluminum:
 - a. Continuous Hook Strips

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Do not deliver to site or install any material or system that has not been approved by the Engineer or Owner. Materials installed without approval may be required to be removed at no additional cost to the Owner.
- B. The prepared roof deck surface must be dry, clean and smooth. Provide dryers, if necessary, to dry deck surfaces prior to installing new work. Open flame devices shall not be used.
- C. Maintain temporary protection of the new and existing roof system throughout the duration of the project. The roof system will be cleaned to the satisfaction of the Owner and Engineer prior to final payment. All areas of stained membrane will be cut out and replaced by the Contractor at no additional cost to the Owner. Multiple patches in close proximity will not be acceptable and will require one large patch.

- D. Comply with the manufacturer's written instructions and these specifications for all roof repairs and associated work. Flashing shall be installed along with the membrane to assure weather tight termination.
- E. Do not cut any material with a solvent or dilutant unless specifically instructed by the manufacturer in writing.
- F. Keep covers tightly sealed on all canned and evaporative products to prevent premature curing.
- G. Partial or unmarked cans or rolls of materials cannot be used.
- H. Do not store rolls of membrane or flashings on the roof without the written consent of the Engineer and Owner.
- I. Refer to the publication, "Copper and Common Sense" by Revere Copper and Brass and all recommendations of the Sheet Metal and Air Conditioning Contractors National Association concerning methods and materials to be used in the fabrication and construction of sheet metal flashings.

3.2 REMOVAL OF EXISTING SYSTEM

- A. Remove all existing roofing materials and flashings down to the existing asphaltic coating. Scrape and sweep clean loose asphaltic coating material. Notify the Engineer of any areas of unsuitable asphaltic coating, roof deck, or associated components.
- B. Remove existing elastomeric roof membrane, base flashings, termination bars, and associated components in their entirety down to existing masonry wall or blocking.
- C. Scrape and clean the existing roof deck, walls and penetration surfaces. Notify the Owner and Engineer of any areas of unsuitable roof deck or associated components.
- D. Sequence work to minimize building exposure between demolition and new roof materials installation. Install temporary roofing and flashing as necessary to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials. Only remove as much roofing and flashings as can be made weathertight the same day with the new work. Arrange each day's termination point to prevent interruption of roof top drainage.
- E. Remove existing strainers, clamping rings, and drain bowls from the existing drain assemblies.
- F. Temporarily support exposed duct work.

- G. Remove, disconnect, store, and reinstall existing rooftop mechanical equipment in preparation for new roof system. Removals, lengthening/shortening, and reinstallations of mechanical equipment including mechanical/electrical connections are to be performed by licensed tradesmen. Costs for mechanical/electrical work shall be included in the Contractor's bid price.
- H. Remove existing mechanical equipment support curbs in preparation for installing new curbs at unit locations as indicated.

3.3 DECK PREPARATION

- A. Allow moist deck sections to dry prior to application of roof insulation. Open flames are strictly prohibited from the roof areas.
- B. Ensure that deck surface and joints are clean of all debris and roofing materials.
- C. Tape cracks and joints in deck to prevent adhesive seepage into building interior.

3.4 INSTALLATION OF INSULATION

- A. Install insulation in strict accordance with the manufacturer's written instructions to achieve the required warranty.
- B. The multi-layered polyisocyanurate insulation and coverboard system shall be installed on properly prepared clean, dry surfaces.
- C. Allow moisture on substrates to dry prior to application of insulation. Open flames are strictly prohibited from the roof areas. Ensure that roof surfaces and joints are clean of all debris.
- D. Insulation boards shall be free of defects including but not limited to, broken corners, improperly adhered facers, excessive moisture, dimensional irregularities, and the like. Defective insulation boards shall be marked and immediately removed from the site.
- E. Install one (1) or more layers of insulation to achieve required thickness. Install tapered insulation to conform to slopes indicated.
- F. The minimum dimension on cut insulation boards shall be twelve inches (12") with a minimum surface area of two square feet (2 sf). Only full-sized insulation boards shall be used at roof perimeters and corners.
- G. All insulation boards shall be installed tightly butted to adjacent insulation, rising walls or wood blocking. If gaps greater than 1/8" exist between boards, the board shall be cut out and replaced.

- H. Construct insulation crickets where shown on the Contract Drawings, and as required to prevent ponding and to direct all runoff water to roof drains. Adhere crickets and/or saddles atop insulation prior to adhering coverboards, or as otherwise required by the roof membrane manufacturer to maintain the specified warranty.
- I. Utilize fiberboard tapered edge strips and polyisocyanurate fillers at all drain locations and as indicated on the Contract Drawings. Step taper the surrounding insulation system down to the drain bowl location. Provide maximum sumps in conjunction with the tapered insulation system.
- J. All insulation boards shall be mechanically secured to the roof deck with the approved fasteners and at the attachment rates as required by the manufacturer.

3.5 COVERBOARD INSTALLATION

- A. Install coverboard in cold adhesive applied in strict accordance with the adhesive manufacturer's printed installation instructions to achieve the required warranty.
- B. Install the coverboard and immediately "walk" the system into place to spread the adhesive for maximum contact. Stagger all end joints to the middle of the long dimension of adjacent boards, 24" minimum. Continue to "walk" the coverboard every 5 to 7 minutes until firm adhesion is achieved. Ballast the boards to prevent cupping. Redistribute ballast to ensure full bonding of the system.
- C. Ensure that boards are totally adhered prior to application of roof membrane.

3.6 FULLY-ADHERED MEMBRANE INSTALLATION

It is the intent of this Specification Section to provide the Owner with a new, fully adhered membrane, 100% bonded to the insulation, of sufficient bond strength to resist **FM 1-120** uplift pressures as defined in FM Data Sheet 1-28, current edition.

- A. Inspect surface of insulation prior to installation of roof membrane. Insulation surface shall be clean and smooth with no excessive surface roughness. Contaminated surfaces or unsound surfaces such as broken or delaminated boards or insulation voids shall be removed and disposed. Cover boards shall be swept and blown clean of all dust prior to applying bonding adhesives.
- B. Install fully adhered elastomeric roofing on all roof areas designated to receive such. Install membrane system in accordance with the recommendations and requirements of the membrane material's manufacturer, as amended in these Specifications. Follow manufacturer requirements concerning application rates for cleaners, solvents, adhesives and similar materials. The application rates for these items given in these Specifications are to be considered nominal and the actual rates will vary from manufacturer to manufacturer.

- C. Position roofing membrane without stretching over the insulation. Lay sheets in a shingle fashion. Allow the membrane to relax for minimum one-half hour before bonding. Fold the sheet back onto itself so that one-half of the underside of the sheet is exposed. It is essential that the fold in the sheet be smooth, with no wrinkles or buckles, because these could cause wrinkles in the sheet during installation. Apply the bonding adhesive in accordance with the manufacturer's published instructions to both the sheet and the substrate, using a 9" plastic core paint roller. Apply the bonding adhesive evenly avoiding globs and puddles. Correct application of the bonding adhesive will render approximately 60 square feet per gallon of finished surface coverage. This is a contact type adhesive and includes coating for the membrane and coating on the substrate. Allow the adhesive to dry until tacky; the adhesive must not string or stick to a dry-finger touch. Roll the coated membrane into the adhesive, being careful to avoid wrinkles. Brush down the bonded half of the sheet with a push broom to achieve maximum contact. Fold back the unbonded half of the sheet and repeat the bonding procedure. No wrinkles shall be allowed in the completed application. Wrinkled sheets shall immediately be removed and replaced and not patched. Do not apply bonding adhesive in areas that are to be spliced to flashings or adjacent sheets. Apply all sheets in the same manner, lapping adjacent sheet a minimum of 6".
- D. Splice adjacent sheets in accordance with the manufacturer's written instructions using the manufacturer's double sided seam tapes (minimum 6" tape). Totally clean areas to be spliced of all talc, dirt and other foreign substances using clean rags with manufacturer's splice wash cleaner or other manufacturer's recommended cleaner. Clean all seam areas at least twice in two separate applications with new rags and cleaner each time. Change the rags and cleaner frequently. It is imperative that these seam areas be totally clean. Install manufacturer's in-seam sealant to cleaned seams as recommended by the membrane manufacturer. Apply seam tape for the full width (minimum 6") of the lap splice. Totally clean the completed splice for a distance of 1" on either side of the edge of the top sheet using clean rags and cleaner. Apply a continuous bead of lap sealant to the edge of the spliced sheet and feather out bead using preformed trowel. Lap sealant must be set daily as the work progresses.
- E. Nail off membrane, after relaxing, adhering and splicing, along all perimeters and around all flashing units. Membrane shall be nailed off with the hook strip flange or termination bar along perimeters as detailed. The membrane at all flashing locations shall be nailed off 6" on center maximum with the specified roofing nails through tin discs. In areas where no metal flanges are installed (such as at roof to wall details), the nailing shall be reduced to 4" on center maximum. All nailing shall be held back 2" from the edge of the membrane. Vertical nailers, when used, shall be fastened 8" on center. Extend membrane behind vertical nailers and secure through it.

- F. Temporary waterstops shall be constructed to provide a 100% watertight seal utilizing a raised temporary waterstop at the end of each day's work. Sweep back and totally clean the gravel and flood coat from the existing roof and set a 2" x 4" stud atop the prepared area in sealant or materials recommended by the membrane manufacturer. Where stopping work on the new system, maintain the stagger of the insulation joints by installing partial fillers. Carry the new membrane up and over 2" x 4" waterstop. Seal the edge of the new membrane onto the old membrane in a continuous heavy application of sealant or materials recommended by the membrane manufacturer. Weight the membrane down in the sealant with a 2" x 10" wood member with ballast on top. Ballast should be approximately 20 pounds per linear foot. When work is resumed, remove all sealant, membrane, insulation fillers, etc. from the area of the waterstop. Do not reuse any of the materials in the new work. If inclement weather occurs while a temporary waterstop is in place, the Contractor shall provide the labor necessary to monitor the situation in order to maintain a watertight condition.

3.7 PERIMETER WOOD BLOCKING INSTALLATION

- A. Refer to FM Data Sheet 1-49 concerning spacing requirements for perimeter blocking anchorage. All anchors and fasteners that attach wood blocking to the structure shall have their spacing halved for an 8-foot length away from all exterior corners of the perimeter.
- B. The perimeter wood blocking shall be installed at a consistent, even height throughout that roof area to provide a flush transition from insulation to blocking and provide an even and continuous line for metal fascia installation.
- C. All butt joints in woodwork shall be flush to provide a smooth, uniform line with no irregularities. Built-up blocking shall have butt joints staggered 4-feet minimum layer to layer. The minimum length of any individual piece of woodwork shall be 2-feet. All lengths of woodwork shall have a minimum of 2 fasteners. Layers of wood blocking at corners shall be interlocked to provide additional stability.
- D. At roof perimeters, the wood blocking and plywood shall be installed as detailed. Provide 8-inch nominal wide blocking at roof perimeters unless otherwise detailed.
- E. Existing wood blocking and curbs may be required to be cut back or trimmed to provide an even flush assembly as shown on the Detail Drawings. This shall be accomplished with power or hand tools. Should cutting of existing components reduce or eliminate securement of their components, the Contractor shall re-secure with the appropriate fasteners.

3.8 FASTENING OF WOODWORK

- A. All new woodwork shall be secured with the specified fasteners spaced 12-inches on center maximum, or unless otherwise specified by Factory Mutual Global's Data Sheet FM 1-49.

- B. All existing woodwork to be reused shall be re-secured with the specified fasteners spaced 12-inches on center maximum, to the roof deck. The Contractor shall be made aware that the re-securement fasteners may need to penetrate multiple layers of existing wood blocking before penetrating the roof deck and shall provide proper length fasteners.
- C. Wood blocking shall be fastened directly to the roof deck with the specified fasteners spaced 12-inches on center maximum, staggered off the centerline of the woodwork being secured. Predrilling of fastener holes shall be completed prior to installing fasteners. Should the wood blocking be greater than a nominal 2x6, fasteners shall be spaced 12-inches on center maximum in pairs.
- D. Wood blocking to wood blocking connections shall be made using the specified fasteners spaced 12-inches on center maximum and staggered off the centerline of the woodwork being secured. Nails shall be of sufficient length to penetrate the receiving member 1-1/2-inches minimum.
- E. Plywood shall be fastened to vertical concrete, CMU, and masonry surfaces with the specified fasteners spaced 8-inches on center both vertically and horizontally.
- F. Plywood shall be fastened to vertical stud framing with the specified fasteners spaced 6-inches on center maximum vertically.
- G. Spacing of fasteners should not exceed 12-inches, 8-feet each way from outside corners. Withdrawal resistance should be 100 lbs. per nail minimum.

3.9 PLYWOOD SHEATHING INSTALLATION

- A. Coordinate this work with that of the other trades to provide the orderly progress of construction and a watertight condition. It is the intent of these specifications to install plywood sheathing at designated parapet walls and where designated on the Contract Drawings.
- B. Secure new plywood sheathing over the substrate accepting the new elastomeric flashings. Where practical, the plywood assembly can be sized to allow the plywood surface to be flush with the wood blocking around the perimeter of the roof system.

3.10 PEEL STOPS

- A. Install continuous peel stop (1"x 1/8" aluminum bar) 4'-0" offset at perimeter of roof or as required by the roof manufacturer. Mechanically fasten 12-inch O.C.
- B. Strip-in with manufacturer's membrane flashing and provide gaps at 8-inch O.C. to allow drainage.

3.11 WATERSTOPS

- A. All flashings shall be installed concurrently with the roof membrane in order to achieve a watertight condition as the work progresses. When a situation arises where a break in the day's work occurs in the central area of a roof, a temporary waterstop shall be constructed to provide a 100% watertight seal utilizing a raised temporary waterstop. Sweep back and totally clean the existing roof and set a 2" x 4" stud atop the prepared area in roof cement as recommended by the membrane manufacturer. Where stopping work on the new system, maintain the stagger of the insulation joints by installing partial fillers.
- B. Carry the new membrane up and over 2" x 4" waterstop. Seal the edge of the membrane in a continuous heavy application of roof cement. Weight the membrane down in the sealant with a 2" x 10" wood member with ballast on top. Ballast should be approximately 20 lb./l.f. When restarting work, remove all sealant, membrane, insulation fillers, etc. from the work area. Do not reuse any of the material in the new work. Cut off contaminated EPDM membrane and dispose of immediately. If inclement weather occurs while a temporary waterstop is in place, the Contractor shall provide the labor necessary to monitor the situation to maintain a watertight condition.

3.12 MEMBRANE FLASHING

All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the job progresses. The Contractor shall arrange his schedule, as much as practical, to install complete distinct roof areas each which, once flashed, will then be installed completely. No temporary membrane flashings shall be allowed without the prior written approval of the Engineer. Approval will only be for specific locations on specific dates.

- A. Ensure that all air intakes and air handling units have been shut off or temporary protected to prevent adhesive fumes from infiltrating the building.
- B. Ensure that all substrates are free from contaminants prior to the installation of the new flashing membranes. Install the manufacturers' buffer or protection sheets as required.
- C. Cured membrane shall be used for flashing purposes as much as practical. Uncured sheets are to be used at vent pipes, inside and outside corners, seams in flashings or at any other location where forming of membrane flashings is required.
- D. Flashing sheet shall be spliced to the membrane first, and then bonded to the mating surface. Totally clean the roof membrane area to receive flashing sheet using new, clean rags and manufacturer's splice wash cleaner. All talc, dirt, excess bonding adhesive and other foreign material shall be totally cleaned from the roof membrane sheet. Clean all seam areas at least twice in two separate

applications with new rags and cleaner each time. After cleaning, apply splicing cement to both the underside of the flashing sheet and the prepared roof membrane for a width of minimum 6". Be sure cement is not on bonding adhesive areas.

- E. Apply bonding adhesive to surface of wood, metal, masonry or other material or surface to be flashed. Also apply bonding adhesive to flashing membrane making sure bonding adhesive is not applied to splice area of flashing and using longest possible lengths of flashing membrane. Apply bonding adhesive using rollers or brushes 100% to all surfaces at a smooth, uniform rate, free of holidays, light spots, globs or similar irregularities, at the manufacturer's application rate. Allow two surfaces of adhesive to dry to a tacky condition, such that adhesive does not stick or string when touched with a dry finger. After bonding adhesive has set on both surfaces, roll flashing onto surface carefully to prevent wrinkles, fishmouths, bridging or similar flaws. Unless otherwise detailed, top of membrane flashings must be minimum 8" above the surface of the roof membrane, 3" minimum above the bottom of metal counterflashings, and minimum 3" past the limits of nail heads or other fasteners. Membrane flashings shall extend the full width of horizontal metal flashing flanges (i.e., gravel stops). After setting, roll membrane into place using a 2" wide steel roller and heavy hand pressure. Roll 100% of the surface to assure total adhesion with no wrinkles or bridging. After rolling, splice vertical or side laps of flashing sheet using minimum 6" wide splices and splicing cement. After applying splicing cement to both mating surfaces of the flashing sheet vertical laps and allowing it to become tacky, roll splice in place as described above.
- F. Inside and outside corners and other changes in direction of flashing sheets shall not be butt-type splices at the point of direction change. All flashing sheets shall be jointed past the change in direction. Inside vertical corners shall be folded with no cuts in the sheet at the corner. Folds shall be "pig's ear" type on flashing sheets entering a corner. Splice shall be made 16" minimum away from corner. Outside vertical corners, such as around curb units, shall extend a minimum of 2" around the corner for each flashing sheet. Contour flashing sheets in place with light pressure. Flashing sheet may be heated, if ambient temperature is below 60 degrees F, in order to work them in place. Heating shall be done with heat lamp or air gun. No open flames can be used. All flashings shall be installed in accordance with the approved shop drawings and manufacturer's instructions, unless amended. Flashings shall be turned up and over the tops of curbs as much as practical.
- G. Membrane flashing terminating on a vertical surface shall be mechanically fastened to the substrate.
 - 1. On wood surfaces, termination bars and flashings shall be secured with the specified large head roofing nails spaced 6" on center maximum or as specifically required by the membrane manufacturer.

2. On masonry surfaces, termination bars and flashings shall be secured using the specified drive pins through predrilled holes spaced 8" on center maximum or as specifically required by the membrane manufacturer.
- H. Strip in all metal flanges such as gravel stops and vents with EPDM. Two ply stripping to be used by applying a 6" wide strip of flashing over which a 9" wide strip is to be applied. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire flange and extend onto the membrane 6" minimum.
- I. Strip in all roof to wall terminations where new membrane will terminate below the existing membrane wall cladding with EPDM. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire flange and extend onto the membrane 3" minimum on each side of the lap.
- J. Strip in all field seams with EPDM with a single 6" wide EPDM stripping membrane. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire seam and extend onto the field membrane 4" minimum.
- K. The Contractor shall flash all roof drains with the new roof system. Extend membrane 1/2" minimum inside clamping ring with a continuous full bead of water cut-off mastic under the membrane.
- L. Lap sealant shall be applied daily along all edges of membranes which terminate on the horizontal, gravel stops and similar locations. After proper installation of membrane flashings, clean the area of the lap with the manufacturer's recommended cleaner and apply continuous bead of lap sealant to all seams, including vertical laps of the flashings. Feather the sealant bead using the preformed trowel. Should uncaulked seams be found to have weathered beneath ponding conditions, the Contractor will be required to strip-in these seams with 6" stripping as required by the Owner.

3.13 PRE-MANUFACTURED ROOF FASCIAS

- A. Confirm that the roof membrane extends down, beyond the transition of the wood blocking as shown on the contract drawings.
- B. Should the new pre-formed metal edge not provide a minimum of 1-1/2-inch coverage over the transition beyond the wood blocking, a two-piece flashing system, of equal dimension, shall be installed around the perimeter of the roof edge to provide a uniform height. Hook strips shall be secured at 3-inches on center, staggered about the center line. Backer plates shall be installed between each seam. The fascia metal shall extend a minimum of two inches below the pre-manufactured metal.

- C. Install a sacrificial piece of roof membrane between the finished roof edge membrane, and the sheet metal hook strip. The membrane shall be sealed to both the finished roof surface, and the metal hook strip to prevent water infiltration under the detail.
- D. Secure the hook strip per the manufacturer's recommendations. Confirm a uniform, level reveal around the perimeter of the building.
- E. Where the edge metal meets a rising wall, coordinate the installation of a blind nailer at these locations to terminate the roofing system.

3.14 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4-inches over base flashing. Lap counterflashing joints a minimum of 4-inches and bed with elastomeric sealant.
 - 1. Secure in a waterproof manner by means of snap-in installation and sealant.
- C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for flashing on vent piping.

3.15 SKIRT FLASHINGS

- A. Fabricate skirt flashings to the configurations shown on the Contract Drawings.
- B. Insert flashings beneath new counterflashings or skirt flashings as detailed. Overlap adjacent sections a minimum of 3-inch.
- C. Secure wall flashing skirt flashing with clips at 12-inches on center and a minimum of two per section. All fasteners shall be concealed.

3.16 COUNTERFLASHINGS

- A. Fabricate new counterflashing and receivers to the dimensions and shapes where shown in the Contract Drawings and as specified herein.

- B. Secure counter-flashings with clips where indicated. Fabricate and secure clips as previously specified.
- C. Clip counterflashings onto new throughwall flashings where indicated.

3.17 BLIND NAILERS

- A. Fabricate and install blind nailer with a 2-inch minimum leg inserted behind membrane. Fasten flashing through leg of blind nailer.
- B. Fold blind nailer to 2-inch-wide final dimension with ½-inch hemmed edge over fastener.
- C. Provide continuous beads of sealant at back and leading edges.

3.18 CONTINUOUS CLEATS AND HOOK STRIPS

- A. Form continuous cleats/hook strips with ¾-inch kicks, bent out at a 30° angle to the face or wall. Height of continuous cleats/hook strips shall be as indicated on the Detail Drawings.
- B. Secure continuous cleats/hook strips to wood blocking with the specified fasteners spaced at 6-inches on center.
- C. Provide 1/8-inch butt joints between hook strip sections.

3.19 SECUREMENT CLIPS

- A. Secure clips to substrate with the specified fasteners at minimum 6-inches on center, or as indicated on the Detail Drawings.
- B. Bend clips a minimum of 1-inch over bottom drip edge of flashing and crimp tightly.
- C. Coordinate with installation of roofing flashing termination bar.
- D. The seams of the sheet metal flashing shall be soldered to provide a watertight detail, and where practical, shall extend eight inches above the finished roof surface. Note that it is the intent of this project to provide pipe wrap details in lieu of pourable sealer boxes when applicable.
- E. Seal the lower limits of the penetration prior to the application of the pourable sealer.
- F. Provide covers over the pourable sealer boxes, notch around conduits and seal.

3.20 SCUPPER BOX

- A. Fabricate and install new scupper boxes for designated locations to match the existing opening. The scupper sleeves shall be fabricated with the longitudinal seam located along the top of the cored opening and fit snugly into place. Scupper sleeve shall have hemmed flanges for securement on the inside of the parapet wall as shown. Secure the tube to the parapet wall with the specified fasteners and extend scupper sleeve 1" minimum beyond the exterior wall surface, keeping flush with the interior wall surface. Coordinate with the roof flashing and edge metal installation.
- B. Utilize the membrane to flash the scupper opening by adhering the flashing membrane to the scupper sleeve.
- C. Terminate the flashing at exposed edges with blind nailers secured with the specified fasteners at 6" on center over a full bead of sealant. Secure the scupper sleeve by crimping. Fold back blind nailers over fasteners to conceal all fasteners. Provide continuous bead of sealant along edges of blind nailers and tool to shed water.
 - 1. Scuppers shall be sized as the following:
Overflow Scupper: 4" H x 4" W minimum.

3.21 INSTALLATION OF SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated, eliminate air pockets, and ensure contact and adhesion of sealant at sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.16 EXPANSION JOINTS

- A. Construct expansion joints as detailed using cured elastomeric roof membrane.
- B. Install new wood blocking and trim existing wood blocking as shown on the Detail Drawings.
- C. Install loop of membrane as required to support fiberglass batt insulation as detailed.
- D. Fill void created by the loop of membrane and wood blocking with batt insulation.
- E. Install foam tube atop looped membrane and wood blocking. Butt all ends of foam rod to prevent voids. Adhere in place with splice cement if required.
- F. Install cured membrane over the foam tube and extend onto adjacent membrane areas 6" minimum. Strip-in all seams with uncured membrane.

3.17 ROOF DRAIN FLASHING

- A. Roof drains shall be flashed by coating the entire sump with a full, 1/8" thick trowel application of roof cement.
- B. Center the lead sheet over the drain bowl and embed the sheet into the roof cement by tamping with a rubber mallet.
- C. Apply membrane flashings as previously described.
- D. Extend stripping from within the clamping ring past the limits of the lead sheet by six inches (6") minimum.
- E. Apply the second ply of stripping to extend past the bottom ply four inches (4") minimum.

- F. Allow the lead sheet and felt stripping to extend inside the clamping ring by one-inch (1") minimum when installing the clamping ring.

3.18 UNIT CURBS

- A. Wood blocking shall be installed to provide curbs to support units as required to raise units 8" minimum above the roof surface as shown on the Detail Drawings.
- B. Mechanical and electrical work requiring extension in order to raise and support units shall be completed by a licensed tradesman.

3.19 CLEANUP

- A. All floor, site and adjacent areas, both interior and exterior, damaged or stained by the installation of the roofing work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.
- B. The Contractor shall not demobilize the site until the completed work is toured by the Owner and Engineer. Any unsatisfactory items observed will be reported in "punch-list" form. These items shall be corrected immediately by the Contractor prior to demobilization from the job site. Final payment will not be made until all punch list items are complete and guarantees have been received.
- C. All scaffolding, barriers, temporary facilities and the like shall be removed upon completion of the work. Areas damaged as a result of the Contractors equipment shall be restored to their original condition, all to the satisfaction of the Owner.

END OF SECTION

I:\837920\02 Design\specs\837920 07 53 00 Elastomeric Roofing and Flashing.docx

SHEET METAL FLASHING AND TRIM

SECTION 07 62 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 04 50 00 – Masonry
- B. Section 06 10 00 – Rough Carpentry
- C. Section 07 53 00 – Elastomeric Roofing and Flashing
- D. Section 22 30 00 – Plumbing

1.3 DESCRIPTION OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice and as required by the material manufacturer, as amended. The work under this Section generally includes the following:
 - 1. Supply all necessary chutes, disposal facilities, transportation, and labor necessary to dispose of all demolished materials, dirt, and debris off-site in a legal dumping area. The Contractor shall obtain all permits necessary to transport and dispose of all materials, rubbish, and debris.
 - 2. Provide all necessary underlayment, miscellaneous flashing, attachment clips, and closure members to ensure a weathertight installation.
 - 3. Install new metal roof edge fascia system and associated components as shown on the Contract Drawings at designated locations.
 - 4. Install new sheet metal flashings and trim as shown on the Contract Drawings, and as required to properly terminate the membrane.
 - 5. Install counter-flashings at roof membrane terminations.
 - 6. Install skirt flashings around roof top equipment units.
 - 7. Install blind nailers at all vertical roof membrane and sheet metal termination locations.
 - 8. Fabricate and install new scupper boxes at designated locations.
 - 9. Complete all associated work.
 - 10. Clean and restore all areas affected by the work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof edge flashings capable of resisting the Wind Zone forces required by Code according to recommendations in FMG Loss Prevention Data Sheet 1-49.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
 - 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12-inches (12") long. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim: 12-inches (12") long. Include fasteners and other exposed accessories.

3. Accessories: Full-size Sample.

D. Contractor to provide site safety plan and Job Hazard Analysis.

1.6 MOCK-UP TEST AREAS

- A. Before full scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture, and appearance match with the existing construction. Test areas will be at locations established by the Owner.
 - 1. Two linear feet (2 LF) of each roof edge metal configuration.
- B. Trial areas shall be repeated until acceptable results are obtained, and the accepted areas shall be a standard for all subsequent work. Construction of test areas shall be in conformance with all Contract Documents and shall use only submitted materials.
- C. Each mock-up shall be a minimum of two feet by two feet (2' x 2') where applicable and shall include all components of the roofing system.

1.7 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
 - 1. Meet with the Owner, Designer, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.9 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak proof, secure, and noncorrosive installation.

1.10 WARRANTY AND GUARANTEE

- A. Upon completion of the work, and prior to final payment, the Contractor shall submit a Guarantee of his work to be free from defect in materials and workmanship. This Guarantee shall be for a period of two (2) years and shall be signed by a Principal of the Contractor's firm and sealed if a corporation.
- B. Finish Warranty – 20-years for aluminum sheets.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Tin-Zinc alloy coated copper shall be cold rolled sheet copper conforming to ASTM B-101-78, 16 oz. Tin-Zinc coating shall be applied by hot dip process to achieve a coating approximately 0.5 mils thick. Sheet length shall be 8' maximum.
- B. Aluminum shall be 0.032", 0.040", 0.050", and 0.063" thick Kynar 500 Fluoropolymer painted aluminum as shown on the Contract Drawings. Color(s) to be selected by the Owner. Aluminum shall have a mill finish for concealed items. Aluminum shall be 3003 alloy, H-14 temper.
- C. Pre-manufactured, Fascia System: Pre-formed, architectural metal edge system. Edge coping shall include:
 - 1. Basis of Design: Tremlock by Tremco or Paraguard by Siplast
 - 2. Tested per ANSI/SPRI ES-1 Standard to a design pressure of 290 lbs./ft² to comply with the International Building Code.
 - 3. Factory Mutual 1-150 (Zone 3 - Corner) approved for wind up lift protection.
 - 4. Color(s) to be selected by the Owner.
- D. All accessories, including but not limited to nails, screws and clips shall be stainless steel or galvanized steel and completely compatible with the surrounding metal to prevent galvanic reaction. Galvanizing shall be per ASTM A153-09.
- E. Termination bars shall be 1/8" x 1" stainless steel, copper, or aluminum bar (as required to prevent galvanic action with the flashings being secured) with pre-

punched holes at 8-inches on center, or as required by the membrane manufacturer.

- F. Rivets shall be 3/16" diameter stainless steel as required by the metal being secured.
- G. Sheet metal flashings shall be shop fabricated. All breaks, bends, and hems shall be uniform, clean, straight lines.
 - 1. All aluminum joints shall be adequately overlapped, back-sealed, and riveted.
 - 2. Flanges shall be 4" wide minimum.
 - 3. Drip edges shall be hemmed ¾-inch wide and break at a 30° angle.
 - 4. Clips shall be 2-inch wide.
 - 5. All flanges to be covered with roofing or flashing membranes shall have a ¼-inch minimum hem on the edge.
 - 6. All sheet metal joints shall have 6-inch-wide cover and backer plates.
 - 7. Blind nailers shall be 4-inch wide, folded to 2-inch-wide final dimension.
 - 8. Fascia reveals shall not exceed 8-inch. Fascia requiring a greater vertical face than 8-inch shall be fabricated as a two-piece system with each face of equal exposure.
 - 9. Maintain equal fascia height around entire perimeter of each roof area and where fascias abut.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- E. Mastic for back-sealing sheet metal against non-metal substrates shall be as recommended by the underlayment manufacturer. Concealed sealant for back-sealing metal-to-metal connections shall be single-component, butyl (polyisobutylene) rubber sealant, heavy bodied for joints with limited movement.
- F. Self-Adhering Modified Bitumen shall be a 40-mil thick minimum with 4 mil, high-density polyethylene film and release paper backing formulated for high

temperature installation in accordance with ASTM D 1970. such as Grace Ultra, Carlisle WIP 300HT, Henry Blueskin PE200HT, or approved equal.

- G. Slip sheet shall be 15-pound red rosin paper.

2.3 FABRICATION SCHEDULE

- A. Note, similar flashing components have been listed under multiple metal fabrications type and thicknesses. The Contractor shall coordinate the use of compatible metals to prevent galvanic corrosion and coordinate painted finish components at visible locations.
1. 0.032" Thick Coated Aluminum:
 - a. Blind Nailers
 2. 0.040" Thick Coated Aluminum:
 - a. Pre-Manufactured Coping/Edge Metal
 - b. Counterflashing
 - c. Skirt Flashing
 - d. Scuppers
 - e. Scupper Flashing
 - f. Fascia
 - g. Drip Edge
 - h. Jamb Flashing
 3. 0.050" Thick Coated Aluminum
 - a. Expansion Joint Cover
 4. 0.050" Thick Coated Aluminum:
 - a. 2-inch Wide Clips
 - b. Hook Strips
 - c. Cleats
 5. 0.063" Thick Coated, or Mill Finished Aluminum:
 - a. Continuous Hook Strips

2.4 FASTENERS

- A. In general, fasteners, straps and other hardware shall be copper, brass, stainless steel, or hot-dip galvanized steel. Galvanizing shall be per ASTM A 153 specifications. Electro-galvanizing will not be accepted.
- B. Fasteners for securement of flashings and hook strips to concrete or masonry shall be ¼-inch diameter hammer drive anchors with zinc sheaths and flat heads such as Zamac Nailins by Rawl, Star Fasteners, Unifast, or approved equal. Anchors shall be of sufficient length to penetrate the substrate 1-1/4-inch minimum.
- C. Sheet metal to wood blocking connections and mechanical unit securement (exposed securement): Self-drilling, self-tapping, Number 10, stainless steel hex-head screws, 1-1/2-inch long, equipped with metal capped EPDM washers.

- D. Nails for flashing securement at wood substrates shall be No. 12 Stubbs gauge, large head, threaded shank, copper, or galvanized steel nails minimum 1-inch long.
- E. Fasteners for securement of the pre-engineered edge metal shall be recommended by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Underlayment: Where installing metal flashing directly on wood substrates, install a course of felt underlayment and cover with a slip-sheet or install a course of polyethylene underlayment.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12-inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used, or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch-deep, filled with elastomeric sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws.
 1. Galvanized or Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
 2. Aluminum: Use aluminum or stainless-steel fasteners.
 3. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric sealant as required for watertight construction.
 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
- I. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 COUNTERFLASHINGS

- A. Fabricate new counterflashing and receivers to the dimensions and shapes where shown in the Contract Drawings and as specified herein.
- B. Secure counter-flashings with clips where indicated. Fabricate and secure clips as previously specified.
- C. Clip counterflashings onto new throughwall flashings where indicated.

3.4 BLIND NAILERS

- A. Fabricate and install blind nailer with a 2-inch minimum leg inserted behind membrane. Fasten flashing through leg of blind nailer.
- B. Fold blind nailer to 2-inch-wide final dimension with 1/2-inch hemmed edge over fastener.
- C. Provide continuous beads of sealant at back and leading edges.

3.5 CONTINUOUS CLEATS AND HOOK STRIPS

- A. Form continuous cleats/hook strips with $\frac{3}{4}$ -inch kicks, bent out at a 30° angle to the face or wall. Height of continuous cleats/hook strips shall be as indicated on the Detail Drawings.
- B. Secure continuous cleats/hook strips to wood blocking with the specified fasteners spaced at 6-inches on center.
- C. Provide 1/8-inch butt joints between hook strip sections.

3.6 SECUREMENT CLIPS

- A. Secure clips to substrate with the specified fasteners at minimum 6-inches on center, or as indicated on the Detail Drawings.
- B. Bend clips a minimum of 1-inch over bottom drip edge of flashing and crimp tightly.
- C. Coordinate with installation of roofing flashing termination bar.
- D. The seams of the sheet metal flashing shall be soldered to provide a watertight detail, and where practical, shall extend eight inches above the finished roof surface. Note that it is the intent of this project to provide pipe wrap details in lieu of pourable sealer boxes when applicable.
- E. Seal the lower limits of the penetration prior to the application of the pourable sealer.
- F. Provide covers over the pourable sealer boxes, notch around conduits and seal.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

I:\837920\02 Design\specs\837920 07 62 00 Sheet Metal Flashing and Trim.docx

EXPANSION JOINTS

SECTION 07 91 20

(Filed Sub-Bid with Section 07 10 00)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies the installation of expansion joints at locations shown on plans, in accordance with the details and specifications. This includes the expansion joint for the transition between cast-in-place concrete and precast concrete.
- B. Related Sections include the following:
 - 1. Section 01 22 00 – Unit Prices
 - 2. Section 03 01 30 – Maintenance of Cast-in-Place Concrete
 - 3. Section 07 18 00 – Traffic Coatings

1.2 SUBMITTALS

- A. Shop Drawings: Provide installation plans and large scale details for all work as indicated on the Contract Drawing.
- B. Product Data: For each type of expansion joint indicated.
- C. All information required to define joint placement and methodology of installation.
- D. Field samples of the gland material suitable for testing by the Testing Agency.
- E. Substitutions: Not permitted.
- F. Submit warranty as identified in Part 1, 1.6.

1.3 ABBREVIATIONS AND REFERENCES

- A. Abbreviations
 - 1. ASTM American Society of Testing and Materials
- B. References
 - 1. ASTM D 2240 Test for Identification Hardness of Rubber and Plastics by Means of a Durometer

1.4 QUALITY ASSURANCE

- A. General

1. Provide written certification that the System Installer has been approved by the Manufacturer.
 2. The Installer shall provide evidence of satisfactory installation of similar systems for a period of not less than five years.
 - a. Submit a listing of no less than five installations in a climate similar to that for this project.
 3. Submit certification that products and installations comply with applicable EPA, VOC and OSHA requirements regarding health and safety hazards.
 4. Manufacturer's technical representative shall be on site during the initial installation of the expansion joints to assure proper installation procedures.
- B. The manufacturer shall review and approve all details prior to installation and confirm its approval in writing to the Engineer.
- C. The manufacturer shall provide test reports on the gland material attesting to the result of the Shore "A" hardness testing in accordance with ASTM D 2240.

1.5 DELIVERY AND STORAGE

- A. Deliver all materials to the site in original, unopened containers bearing the following information:
1. Name of Product.
- B. Store materials on blocks or skids under cover and protect from weather. Replace packages or materials showing any signs of damage with new materials at no additional cost.
1. Do not store material directly in contact with slabs or grade.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: The System Manufacturer shall furnish the Owner with a written responsibility warranty that the system will be free of defects, water penetration, and chemical damage related to the system design, workmanship or material deficiency. Include failures due to:
1. Any adhesive or cohesive failure.
 2. Abrasions or tear failure resulting from normal traffic use.
- C. If any of the materials show any of the listed defects, provide labor and materials to repair all defective areas.
- D. Warranty Period: Five years from date of substantial completion.

- E. Damage inflicted by vandalism, abnormal abrasive maintenance equipment, and spinning studded snow tires are not considered normal traffic use; therefore, damages inflicted by these causes are exempted from Warranties under this Section.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. The expansion joint seal system shall be a complete system of compatible materials designed by the manufacturer to produce a waterproof, traffic-bearing expansion joint seal.
- B. The elastomeric seal element shall be a continuous, neoprene extruded unit, vulcanized into its definitive shape and meet the following performance criteria:
- | | | | |
|----|---------------------|-------------|-------------|
| 1. | Tensile Strength | ASTM D 412 | 2000 psi |
| 2. | Ultimate Elongation | ASTM D 412 | 250% (min.) |
| 3. | Hardness, Type A | ASTM D 2240 | 55 + 5 |
- C. The elastomeric concrete nosing material will meet the following performance criteria after seven-day cure.
- | | | | |
|----|---------------------|-------------|-------------|
| 1. | Tensile Strength | ASTM D 638 | 750 psi |
| 2. | Ultimate Elongation | ASTM D 638 | 200% |
| 3. | Tear Resistance | ASTM D 624 | 80 lb./inch |
| 4. | Hardness, Type D | ASTM D 2240 | 35 |

2.2 EXPANSION JOINTS

- A. Expansion Joint System: Shall be comprised of heat-weldable thermoplastic-rubber, multi-celled extrusion with perforated flanges embedded in elastomeric concrete nosing. Final selection of seal size to be coordinated between manufacturer, Engineer and Contractor and shall accommodate movements of structural design and expected temperature variations. System shall be installed into blockouts on each side of joint to manufactures guidelines. All transitions in plane and terminations to be watertight. Subject to compliance with requirements, products that may be incorporated into the work include the following:
1. Concrete-to-Concrete Joints
 - a. Wabo Crete ME-300 - System; Watson Bowman Acme Corporation.
 - b. Emseal ThermaFlex TCR 300; Emseal Joint System LTD.
 - c. LockCrete Membrane System LMS-350; MM Systems.

PART 3 – EXECUTION

3.1 INSPECTION

A. General:

1. Inspect surfaces to receive the work of this Section and report immediately in writing to the Engineer and Contractor any deficiencies in the surface preparation which render it unsuitable for proper execution of the work.
2. Coordinate with related work contractors and verify that the related work meets the following requirements:
 - a. Concrete surfaces are finished appropriately to receive the work.
 - b. Curing compounds used on the concrete surfaces are compatible with the work to be installed.
 - c. Concrete surfaces have endured the proper curing period for the system selected.
 - d. Joint width is appropriate for the product supplied.
3. Acid etching is prohibited.

3.2 PREPARATION

- A. Check adhesion to substrates and recommend appropriate preparatory measures.
- B. Proceed with expansion joint installation only after unsatisfactory conditions have been corrected in a manner satisfactory to the Installer.
- C. Clean joints thoroughly in accordance with manufacturer's instructions to insure all laitance, unsound concrete and curing compounds which may interfere with adhesion.
- D. Where joint provided is less than the minimum width required for installation and for movement anticipated, sawcut or grind edges to increase width to the required minimum.
- E. Cease installation work when adverse weather conditions or temperatures are beyond the manufacturer's recommendations.

3.3 INSTALLATION

- A. Complete all work as shown on the Contract Drawings in strict accordance with the Manufacturer's written instruction and specifications including, but not limited to, the moisture content of the substrate, the atmospheric condition (including relative humidity and temperature), coverages and texture.

END OF SECTION

JOINT SEALANTS

SECTION 07 92 00

(Filed Sub-Bid with Section 07 10 00)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 22 00 – Unit Prices
- B. Section 03 01 30 – Maintenance of Cast-in-Place Concrete
- C. Section 07 18 00 – Vehicular Traffic Coatings

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection and heating, tools and appliances necessary for the proper completion of the work in this Section, as required in the specification and in accordance with good construction practice. The work under this Section generally includes the following:

- A. Install sealant at all routed cracks in the concrete slab as indicated on the Contract Drawings. Coordinate cutting of concrete with Section 03 01 30 – Maintenance of Cast-In-Place Concrete.
- B. Install sealant at all concrete control/ construction joints in the concrete underneath the vehicular traffic coating.
- C. Install backer rod and sealant at all pipe penetrations where required to provide smooth transition for deck coating system.
- D. Install sealant at all concrete drain gates.
- E. Clean and restore all areas affected by the work.
- F. Install sealant at all other locations as noted on the Contract Drawings.

1.4 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, temporary heat, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.
- B. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the Work.
- C. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied.
- D. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.
- E. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.
- F. The Contractor shall provide all masking and protection for adjacent areas and promptly clean any spills or stains from new or existing construction.
- G. The general nature, quantity and surface area of the various work items are shown on the Contract Drawings.

1.5 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed Work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.6 SUBMITTALS

- A. Refer to Section 01 33 00 – Shop Drawings and Submittals for submittal provisions and procedures.
- B. Manufacturers' literature, Specifications and Color Charts shall be submitted for the following materials:
 - 1. Sealants
 - 2. Primer
 - 3. Backer rod

- C. Contractors proposed means and methods for joint substrate grinding, solvent cleaning and removal of all residual existing materials.

1.7 REFERENCE STANDARDS

- A. ASTM C719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
- B. ASTM C920 Specification for Elastomeric Joint Sealants
- C. ASTM C1330 Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants

1.8 MOCK-UPS

- A. Before commencing full scale work, install a minimum five (5) linear feet of each type of sealant and sealant configuration, at all sealant joint locations referenced in the scope of work. Sealant installation shall conform to the Contract Documents and once accepted shall become a standard for all subsequent work on the Project.
- B. After curing for seven (7) days, the test areas shall be viewed, sampled and/or removed as directed by the Owner to establish to his satisfaction the actual performance of the installed materials. Evidence of improper or unsatisfactory performance shall be grounds for rejection of any or all of the submitted materials.
- C. Random test cuts will be performed by the sealant manufacturer's technical representative through the construction operations to confirm the work practices. The Contractor will be required to repair each test cut location at no additional cost to the Owner.

1.9 QUALITY ASSURANCE

- A. Field-Adhesion Testing: Prior to commencement of full-scale Work, Contractor shall coordinate sealant manufacturer's technical representative to be on site to perform the following adhesion tests in accordance with ASTM C1521 on the installed mock-ups:
 - 1. Conduct tests for each type of sealant and joint substrate, with and without primer.
 - 2. Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Use alternate materials or modify installation procedures, or both, for sealants that fail to adhere to substrates.
 - 3. Tests on mock-ups shall be repeated until satisfactory results are achieved.
- B. Random test cuts will be performed by the sealant manufacturer's technical representative through the construction operations to confirm the work practices. The Contractor will be required to repair each test cut location at no additional cost to the Owner. Submit results to Engineer for review.

1.10 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the Work.
- C. All trash and debris shall be completely removed from the Site daily during the Work and at the completion of the Work. All debris shall be legally disposed of off-site.

1.11 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship. The warranty shall be for a period of five (5) years.

PART 2 – MATERIALS

2.1 SEALANTS

- A. Prepared Cracks:
 - 1. Sealant for use to fill prepared cracks shall be a solvent-free, moisture-tolerant, flexible epoxy control joint sealer and adhesive, either non-sagging or self-leveling as required such as Sikadur 51 as manufactured by Sika Corporation, Inc., or Engineer approved equal.
- B. Drain Collar Joints:
 - 1. Sealant for use to fill prepared perimeter grate joint located in new drains shall be a multi-component, high performance, low-modulus polysulfide sealant with a joint movement of 25% such as Sonolastic Polysulfide Sealant as manufactured by BASF, or Engineer approved equal.
- C. Control Joints and Prepared Cracks:
 - 1. Sealant for use to fill prepared control joints under and in contact with waterproofing base layer (primer) shall be a solvent-free, moisture-tolerant, flexible epoxy control joint sealer and adhesive, either non-sagging or self-leveling as required such as Sikadur 51 as manufactured by Sika Corporation, Inc., or Engineer approved equal.
- D. Cove Joints:
 - 1. Traffic grade sealant for use in exposed joints, coves, and penetration perimeters shall be a premium-grade, polyurethane-based elastomeric sealant conforming to ASTM C920, Type M, use T with a joint movement capability of 25% such as Sikaflex-2c NS TG as manufactured by Sika Corporation, Inc., or Engineer approved equal.

- E. Color(s) shall be selected by the Owner from the approved manufacturer's color chart. The Owner may require a minimum of a two (2) sealant colors to be installed at each new sealant joint type. The Contractor will include multiple colors in the Bid.

2.2 SEALANT ACCESSORIES

- A. Primer shall be non-staining type as manufactured or recommended by the sealant manufacturer for each substrate
- B. Joint cleaner shall be non-corrosive and non-staining as recommended by the sealant manufacturer. Cleaner shall be totally compatible with the sealant for each substrate.
- C. Bond breaker tape (if determined by Engineer to be required after surface preparation) shall be pressure-sensitive tape as recommended by the sealant manufacturer.
- D. Backer rod (if determined by Engineer to be required after surface preparation) shall be continuous length, extruded polyolefin foam consisting of a non-absorbing outer skin and a highly resilient interior network of open and closed cells, as recommended by the sealant manufacturer. Backer rod shall be compressible, resilient, non-waxing, non-extruding and non-staining. Backer rod shall be of sufficient size to be compressed 30% of maximum joint width and shall be totally compatible with the sealant, primer and substrates. Backer rod shall not out-gas when ruptured. Backers shall conform to the requirements of ASTM C 1330 - Type B, such as Dual Rod by Nomaco, or Engineer approved equal.
- E. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing.
- B. Keep covers tightly sealed on all evaporative products to prevent premature curing.
- C. During the removal of any existing component, the Contractor shall report to the Owner and Engineer any areas of damaged, deteriorated or otherwise unsuitable substrates uncovered during the Work. Do not cover unacceptable areas until reviewed by the Owner and Engineer. Provide temporary protection to the area in question.

- D. Comply with the manufacturer's written instructions and these Specifications pertaining to sealant installation.

3.2 JOINT PREPARATION

- A. Ensure all work occurring at sealant joint locations has been completed prior to the start of sealant installation. Coordinate work with Section 03 01 30 – Maintenance of Cast-in-Place Concrete.
- B. Clean all substrates to receive the joint sealants using the manufacturers recommended cleaners and surface preparation techniques. The removal and cleaning of sealants and adhesives shall be as specified herein and in accordance with the sealant manufacturer's written recommendations.
- C. Clean each previously prepared bonding surface with applications of the manufacturers recommended solvent and clean white rags. Apply solvent by brush and wipe surfaces clean. Repeat a minimum of two (2) times, more often if necessary.
- D. Joint primer shall be applied to all properly prepared, cleaned and dry substrates. Primer shall be recommended and approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.
- E. Primer shall be applied and allowed to dry prior to the application of joint backer, bond breaker or sealant.

3.3 BACKER ROD AND BOND BREAKER TAPE

- A. Joint backing rods shall be installed with approximately 30% compression at 70° F. Do not stretch, twist, tear or puncture joint backing. Butt joint backings tightly at intersections.
- B. Joint backing shall be installed at the required depth to provide the joint width/depth ratio recommended for the sealant.

3.4 SEALANT

- A. Precondition sealants to a temperature between 60 and 75 degrees F or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between 60 and 85 degrees F.
- B. All sealants shall be applied to clean, dry joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.
- C. Sealant shall be forced into the joint to completely fill the void and achieve full "wet out" of the bonding surfaces. Force sealant into the joint and against the sides of the joint. Avoid pulling sealant from sides.

- D. Tool sealant immediately to assure full adhesion. Sealant shall be dry tooled to be straight, uniform, smooth and neatly finished to the profiles detailed and to shed water. No soaps, wetting or slicking agents will be allowed.

3.5 CLEAN-UP

- A. Prior to acceptance of the sealant work covered in this Section, the Contractor shall perform a thorough clean-up of the Work site, Building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

I:\837920\02 Design\specs\837920 07 92 00 Joint Sealants.docx

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank

OPENINGS FILED SUB-BID REQUIREMENTS

SECTION 08 40 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Storefronts and Entrances" include all of the following listed Specification Sections in their entirety.

SECTION – 08 50 00 – STOREFRONTS AND ENTRANCES

- D. The Work of this section is shown on Drawings
A201, A204, A207, A215, A801, A802
- E. SUB-SUBS
 - 1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\837920 08 50 00 Storefronts and Entrances (Filed Sub-Bid).docx

STOREFRONTS AND ENTRANCES

SECTION 08 50 00
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all Sections within Division 1 for additional information.

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this section, as required in the specifications and in accordance with good construction practice. The work under this section generally includes the following:

- A. Coordinate work within this Section with all other associated sub-trades to perform work in an orderly fashion and to minimize temporary supports and weather protection.
- B. Install new metal flashings, trim, cladding and sealants at storefront openings.
- C. Install metal anchors, angles, mullions and clips to properly support and anchor the new assemblies.
- D. Install new storefront and entrance systems, in properly prepared openings.
- E. Clean and restore all areas affected by the work to the satisfaction of the Owner.

1.4 JOB CONDITIONS

- A. All surfaces to receive storefront and entrance assemblies shall be thoroughly dry. The substrate surfaces shall be swept and vacuumed clear of all debris. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surfaces prior to the application of the materials. No open flames of any kind will be permitted on the subject project at any time.
- B. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.
- C. All existing security systems disconnected to install the new storefront and entrance systems must be properly reconnected and functioning at the end of each work day.

- D. The Contractor shall be responsible for securing and protecting his equipment, materials, and tools (as well as partially completed construction) from vandalism or abuse.
- E. Materials that have a temperature other than the application temperatures of the manufacturer shall not be applied.
- F. The Contractor, his workmen, all his suppliers and agents shall make every effort to work in harmony with the building occupants.

1.5 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 30 00-Shop Drawings and Submittals.
- B. The Contractor shall submit the following items with their submittal package:
 - 1. Methods of removal of materials.
 - 2. Temporary protection procedures.
 - 3. Staging/set-up procedures.
- C. Storefront and entrance parts catalog shall be submitted by the Contractor detailing replacement parts and current prices.
- D. Provide one sample of the specified glazing and hardware to be submitted with the submittal package.
- E. Samples of all sealants, gaskets and fasteners shall be submitted.
- F. Submit shop drawings and color samples for storefront and entrance framing.
- G. Submit Certified Test reports for all referenced requirements.
- H. The Contractor shall submit a full set of shop drawings for the installation of the new storefront and entrances which include all dimensions, sizes, existing conditions, materials to be removed, etc. Shop drawings for head, jamb and sills for each different existing condition shall be submitted.

1.6 TEST AREAS

- A. Before commencing full-scale work, install one (1) sample storefront in finished openings. Installations shall conform to the Contract Documents and once accepted shall become a standard for all subsequent work on the project.
- B. Test areas shall be repeated until acceptable results are obtained and the accepted area shall be a standard for all subsequent work. Installation of test items shall be in conformance with all Contract Documents and shall use only submitted materials. After curing for seven days, the test areas shall be viewed, sampled and/or

removed as directed by the Engineer to establish to his satisfaction the actual performance of the installed materials. Evidence of improper or unsatisfactory performance shall be grounds for rejection of any or all of the submitted materials.

- C. The contractor shall test fenestration products for air leakage resistance and water penetration resistance as specified at various stages of the product installation.

1.7 WARRANTIES

Upon completion of the work and prior to final payment, all applicable manufacturer's guarantees for storefront frames and hardware including warranties shall be provided:

- A. Storefront manufacturer's two (2) year warranty against defective materials or workmanship, including non-compliance with applicable specification requirements and industry standards, which results in premature failure of the storefront, finish, factory glazed glass, or parts outside of normal wear. Defective components will be repaired or replaced by the Manufacturer at no cost to the Owner. The warranty shall include the following:
1. Storefront and entrance manufacturer's 5-year guarantee on insulated glazing units.
 2. Storefront and entrance manufacturer's 10-year guarantee on painted finishes.
- B. Warrant doors and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering. Defects shall include:
1. Warp or twist of 1/4 inch or more in any 3 foot 6 inch by 7 foot section of a door.
 2. Telegraphing of any part of core assembly through face to cause surface variation of 1/100 inch or more in a 3 inch span.
 3. Delamination to any degree.
 4. Replacement under this warranty shall include reasonable cost of hanging, installation of hardware, and finishing.
 5. Warranty period shall be ten (10) years minimum starting on date of shipment.
- C. Provide guarantee from hardware supplier as follows:
1. Closers: Ten years
 2. Exit Devices: Three years
 3. Hinges: Life of building
 4. All other hardware: One year

- D. Starting date for all warranty periods to be the date of substantial completion of the project.
- E. Upon completion of the work and prior to final payment, the Sub-Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

1.8 PROTECTION OF WORK AND MATERIALS STORAGE

- A. Follow storage and handling requirements of the manufacturer.
- B. Glazing materials shall be delivered in the manufacturer's original unopened containers, leaving manufacturer's label intact.
- C. Any work damaged by the work under this Section shall be repaired by the Contractor at no expense to the Owner.

1.9 MAINTENANCE

- A. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance and removal and replacement of door hardware.
- B. At the completion of the job furnish 2 copies of the following:
 - 1. Maintenance instructions for each item of hardware.
 - 2. Catalog pages for each product.
 - 3. Parts list for each product.
 - 4. Copy of final hardware schedule.
 - 5. Copy of the final Keying Schedule.

PART 2 - MATERIALS

2.1 STOREFRONTS AND ENTRANCES - GENERAL

- A. Standards: Except as otherwise indicated, requirements for storefront and entrance terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA/NWWDA 101/I.S.2-97, and applicable general recommendations published by AAMA and ANSI.
- B. All vertical mullions, frames, clips and securements shall be certified by the manufacturer to meet a 36 psf wind load in accordance with the Massachusetts State Building Code, AAMA/NWWDA 101/I.S.2-97 and as required by the storefront manufacturer. Steel reinforcing of the aluminum frames may be required to meet the required design wind load. Certification of anchorage to all substrates shall also be provided. Certification shall be provided by a Registered Engineer.

- C. Performance and Testing: Except as otherwise indicated, comply with air infiltration tests, water resistance tests, and applicable load tests specified in AAMA/NWWDA 101/I.S.2-97 for type and classification of storefront units required in each case.
- D. All samples submitted for testing shall be full size per AAMA requirements. Reduced size test results will not be accepted.
- E. Testing: Where manufacturer's standard storefront units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer showing compliance with such tests.
 - 1. Test reports shall be not more than four (4) years old.
 - 2. Sample submitted for tests shall be of manufacturer's standard construction and shall have been tested in accordance with ASTM 283-83. The sequence of tests shall be optional between manufacturer and the testing laboratory except that in all cases, the air infiltration test shall be performed before the water resistance test.
- F. Specific Performance Requirements: Entrance systems shall conform to specified ANSI/AAMA standards and the following, whichever are the more stringent:
 - 1. Air Infiltration Test: The unit shall be subjected to an air infiltration test in accordance with ASTM E 283-91. Air infiltration shall not exceed .06cfm/ft² when tested at a pressure of 6.24 psf.
 - 2. Water Resistance Test: The glazed unit shall be mounted in its vertical position continuously supported around perimeter. The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
 - 3. Condensation Resistance Factor: When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
 - a. Glass to Exterior – 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
 - b. Glass to Center – 62_{frame} and 68_{glass} (low-e) or 63_{frame} and 56_{glass} (clear).
 - c. Glass to Interior – 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear).
 - 4. "U" Value Tests (Co-efficient of Heat Transfer): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than **0.42** BTU/hr/ft² /°F. per NFRC 100 for the entire assembly (combined glass and frame).

2.2 STOREFRONT AND ENTRANCE SYSTEMS

- A. Metal entrance systems shall be exterior, pressure glazed, extruded aluminum frame with thermal breaks. Nominal frame depth shall be 4-1/2" with a nominal frame width of 2".
- B. Basis of design is XTherm Series 403X Thermal storefront System as manufactured by Efco Corporation. Subject to the requirements of this Section,

comparable products by one of the following manufacturers may be submitted for review and approval by the Architect:

1. Vistawall Products
 2. Wasau Window and Wall Systems
 3. TriFab as manufactured by Kawneer
 4. or Approved equal
- C. Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
1. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505
- D. All frames shall be extruded 6063-T5 aluminum alloy with a minimum nominal material wall thickness of .080". Vertical mullions shall be steel reinforced as required.
- E. The entrances shall be assembled in a secure and workmanlike manner to perform as herein specified. All frames shall be constructed with shear block corners. Vertical frame members shall extend for the full frame height without interruption. All frame joints shall be sealed with a non-hardening mastic to provide a watertight joint.
- F. Frames shall be prepared and reinforced to receive door hardware, including hinges and closers in accordance with the approved door hardware schedule and templates. All reinforcing shall be 1/4" thick, Type 304, stainless steel. Reinforcing shall be bolted to frames and subframes such that it may be removed and replaced in the future. No hardware shall be secured to or through aluminum only.
- G. Door frames shall be provided with continuous extruded aluminum door stops. Door stops shall be furnished with vinyl, bulb type insert weather-stripping.

2.3 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503.1: Maximum of 0.09 BTU/hr x sf x degrees F.

2.4 ALUMINUM EXTERIOR DOORS

- A. Wide stile, vertical face dimension for high traffic applications.
1. The door shall be 2" thick and stile and rail face dimensions of:
 - a. Vertical stile: 5"
 - b. Top Rail: 5"

- c. Bottom Rail: 6-1/2"
- 2. Major portions of the door members to be 0.188" nominal in thickness and glazing molding to be 0.05" thick.
- 3. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
- B. Finishes: Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating. Color to be determined by Architect and Owner.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.5 VISION LITES FOR DOORS

- A. Refer to Section 2.17 below.

2.6 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and door hardware sets indicated in Section 3.9 Hardware Schedule.
- B. Designations: requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Section 3.07 Hardware Schedule. Products are identified by descriptive titles corresponding to requirements specified in Part 2 – Products.

2.7 FINISH HARDWARE MATERIALS

- A. Furnish items of hardware required to complete the work in accordance with these specifications and the manufacturer's instructions. Items or hardware not specified shall be provided even though inadvertently omitted from this specification. Items shall be of equal quality and type.
- B. Gauges specified herein are U.S. Standard for ferrous metals, and Brown and Sharpe for non-ferrous metals. Gauges and thickness of materials shown or specified are the minimum. Materials shall conform to the requirements specified for the particular item, and where these requirements are not specified in detail, the materials shall be suitable for the intended usage of the item.
- C. Hardware shall comply with the requirements of the following standards. American National Standard Institute (ANSI) numbers are specified for hardware items, except when only Builders Hardware Manufacturers Association (BHMA) numbers are available.

- ANSI 156.1 Butts and Hinges (Grade 1)
 - ANSI 156.13 Mortise and Locks and Latches (Grade 1)
 - ANSI 156.3 Exit Devices (Grade 1)

STOREFRONTS AND ENTRANCES

08 50 00-7

| | |
|------------|---------------------------------|
| ANSI 156.4 | Door Controls- Closers |
| ANSI 156.7 | Template Hinge Dimensions |
| ANSI 156.8 | Door Controls- Overhead Holders |
| BHMA 1301 | Materials and Finishes |
| BHMA 1201 | Auxiliary Hardware |

- D. All hardware shall be best grade, entirely free from imperfections in manufacture and finish. Qualities, weights and sizes specified herein are the minimum that will be accepted.

E. Acceptable Manufacturers

Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

- F. Finish of all hardware items shall be ANSI Code 630, Satin Stainless Steel (US32D) unless otherwise noted.
- G. Exposed fasteners shall be stainless steel as recommended by the hardware manufacturers for each hardware item specified.

NOTE: For all items listed in paragraph 2.8 – 2.13, product numbers are listed from the Scheduled Manufacturer for the purposes of establishing type and quality only.

2.8 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch-thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bommer Industries, Inc.
 - b. Hager Companies; Hager-Roton
 - c. McKinney Products Company; an ASSA ABLOY Group company
 - d. Pemko Manufacturing Co.
 - e. Select Products Limited
 2. Grade: 1-150
 3. Type: Fully concealed.

2.9 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LCN Closers; an Ingersoll-Rand Company; 4000 Series Cush-N-Stop
 - b. Norton Closers 9500 Series Closer
 - c. Corbin Russwin DC3000 Series Closer
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 LOCK CYLINDERS

- A. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Six
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover- type cam
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill- resistant testing requirements in UL 437 (Suffix A).
 - 4. Basis of Design Product: Subject to compliance with requirements, provide Schlage Commercial Lock Division, an Ingersoll-Rand Company; Primus or comparable product by one of the following:
 - a. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group company.
 - b. SARGENT Manufacturing Company, an ASSA ABLOY Group company.

- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders, employing "restricted keyway."
- D. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 12 construction temporary change keys and 2 temporary core control keys.
 - a. Replace construction cores with permanent cores as directed by Owner.
- E. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Existing System: Grand master key locks to Owner's existing system.
- F. Keys: Nickel silver.
 - 1. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.11 DOOR PULLS

- A. Offset door pulls shall be anodized aluminum, 8 ¾" high by 3" wide with a clearance of 2 ½" as provided by the door manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated
 - b. Hager Companies
 - c. IVES Hardware; an Ingersoll-Rand Company
 - d. Rockwood Manufacturing Company

2.12 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Pemko Manufacturing Co.
 - b. Reese Enterprises
 - c. Zero International

- B. Rigid, Housed, Perimeter Gasketing: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with stainless steel screws.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pemko Manufacturing Co.; Model 305
 - b. Reese Enterprises; Model DS370
 - c. Zero International; Model 139A
- C. General: Provide continuous weather-strip gasketing on exterior doors. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- E. Door Sweeps: Gasket material held in place by flat metal housing or flange; surface mounted to face of door with screws.
 - 1. Gasket Material: Neoprene
 - 2. Housing Material: Aluminum

2.13 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies
 - b. National Guard Products
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises
- B. Saddle thresholds shall be Pemko 272A, aluminum, 6" depth, 1/4" high and equal door opening dimension.
- C. Fasteners for securing fasteners to concrete or masonry substrates shall be flat head type, 1/4" diameter, self tapping masonry screws. Shank shall be of sufficient length to penetrate the substrate 2" minimum.

2.14 ACCESSORIES

- A. Two piece thermally broken receptors for head and jamb locations shall be continuous 6063-T5 extruded aluminum with prepunched holes spaced 12" on

center. Receptors shall have self-contained thermal breaks and finished to match the storefront assembly.

- B. Thermally broken sub-sills at designated storefront sills shall be continuous 6063-T5 extruded aluminum with self contained thermal breaks and finished to match the storefront assembly.
- C. Insulation to fill voids in entrance frames and to fill voids in construction shall be extruded polystyrene conforming to ASTM C578, with a 0.1% maximum absorption volume conforming to ASTM C272.

2.15 FASTENERS

All screws, nuts, washers, bolts, rivets and other miscellaneous fastening devices incorporated in the project shall be of stainless steel except where noted below. Fasteners shall be as follows:

- A. Aluminum to aluminum fasteners shall be self-drilling, self-tapping screws, No. 14 of sufficient length to penetrate the receiving substrate by 5/8".
- B. Aluminum to wood fasteners shall be wood screws, No. 14, of sufficient length to penetrate the receiving substrate by 1-3/4".
- C. Fasteners for securing storefronts and wood blocking to concrete or brick masonry shall be 1/2" diameter stainless steel epoxy anchor bolts. Anchors shall be of sufficient length to penetrate the substrate 4-1/2" minimum. Anchors shall be Chem Stud Bolts as manufactured by the Rawl Plug Company, Parabond by Molly, Hit C-20 System by Hilti or approved equal. Revisions to anchor size and strength shall be as recommended by the storefront manufacturer.
- D. Fasteners for securing typical wood blocking to wood blocking connections shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the receiving member a minimum of 1-1/2".
- E. Fasteners for securing wood blocking to steel framing shall be 1/4" diameter flat head type stainless steel self-tapping screws. Shank shall be of sufficient length to penetrate the substrate 1" minimum.

2.16 FINISH

- A. Finish for all exposed metal parts of new aluminum storefront and entrance shall be a Resin-Based Coating- Hylar 5000, or Kynar 500. Paint dry film thickness shall be not less than 1.0 mils +/- 0.2 mils. Surface preparation and coating shall conform to AAMA 2605 Specifications.
- B. Finish for door hardware shall be standard BYMS A156.18, as indicated.

- C. Protect metal finishes on exposed surfaces from damage by applying a strippable, temporary protection covering before shipping.
- D. Variations in appearance of abutting or adjacent pieces are acceptable if they are within on-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- E. Colors shall be selected from the manufacture's standard color chart by the Owner:

2.17 GLAZING

- A. Glass shall be sized to meet a 36 psf load in accordance with the Massachusetts State Building Code and AAMA/NWWDA 101/I.S.2-97. Storefront units shall be factory glazed. Glass shall conform to the following: (Refer to Contract Drawings for specific glass type locations)
 - 1. Tinted glass shall be ¼" thick heat strengthened in accordance with ASTM C1048 Kind HS and conforming to ANSI Z 97.1 specifications. Glass performance shall be Light Transmittance 42%, shading coefficient .46. Color shall be Grey.
 - a. Manufacturers: Glass shall be Pilkington/Libbey-Owens-Ford, or PPG, Oldcastle, or approved equal.
- B. Insulated glass units shall be comprised of the specified glass for a total thickness of 1". Insulated glass units shall be hermetically sealed and shall be IGCC-CBA rated and certified. IGCC number shall appear on the spacer of the insulated glass unit. All insulated glass units shall conform to ASTM E774-88 Class CBA Specifications.
 - 1. Total thickness: 1" with ½" air space
 - 2. Air space: Argon filled
 - 3. Spacer: Spacer shall be constructed of a non-thermal bridging material.
 - 4. U-Value (summer): .33 maximum or as required by the manufacturer to achieve desired assembly u-factor.
 - 5. SHGC: .40
 - 6. Shading Coefficient: .71
 - 7. Primary Seal: Compressed polyisobutylene
 - 8. Secondary Seal: Silicone
 - 9. All glass shall be tinted

2.18 FLASHING AND ACCESSORIES

- A. Sheet metal for exposed flashings shall be .032" .040" thick painted or mill finish aluminum. Aluminum shall be finished on both surfaces as specified in Paragraph 2.08 of this Section.
- B. Sheet metal flashings shall be shop fabricated. All breaks, bends and hems shall be uniform, clean, straight lines.

1. Drips shall be hemmed 3/4" wide and break at a 30° angle.
 2. Pan flashings shall turn up at the rear 1" minimum to form end dams.
- C. Fabrication Schedule:
1. Aluminum, painted finish (.032")
 - a. Jamb Flashing
 2. Aluminum, painted finish (.040")
 - a. Sill Pan Flashing
 - b. Head Flashing
 - c. Counter Flashing
 3. Aluminum, mill finish (.040")
 - a. Hookstrip

2.19 SEALANT AND ACCESSORIES

- A. Exterior sealant for use as primary weather seal, unless otherwise recommended by the system manufacturer, shall be a one-part, neutral-cure, non-staining, silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 50, Uses NT, M, G, A and O such as;
1. **SPECTREM 3** by
Tremco
3735 Green Road
Beachwood, OH 44122
Telephone 216-292-5000
 2. **DOW CORNING 790** by:
Dow Corning
PO Box 994
Midland, MI 48686
Telephone 989-496-7881
 3. **SIKASIL-WS90** by:
Sika Corporation
30800 Stephenson Highway
Madison Heights, MI 48071
Telephone 248-577-0020
 4. Or Approved Equal
- B. Interior caulking shall be one-part, odorless, neutral cure silicone compound as manufactured by Tremco, PRC, Pecora or approved equal.
- C. Color(s) shall be selected by the Owner from the approved manufacturer's premium color chart.

- D. Cleaners and primers shall be as recommended by the manufacturer of the caulking.
- E. Bond breaker tape shall be self adhesive polyethylene tape as recommended by the sealant manufacturer.
- F. Backer rod shall be continuous length, closed cell polyethylene foam, as recommended by the sealant manufacturer. Backer rod shall be compressible, resilient, non-waxing, non-extruding and non-staining. Backer rod shall be of sufficient size to be compressed 30% of maximum joint width and shall be totally compatible with the sealant, primer and substrates. Backers shall conform to the requirements of ASTM C 962 - Type A, ASTM D 1622, ASTM D 1623 and ASTM D 5249 such as Green Rod by Nomaco, Sonofoam by Sonneborn, ITP soft type backer rod or approved equal.
- G. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

2.21 DOOR FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by the Engineer.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine or Wood Screws: For the following fire rated applications:
 - a. Mortise hinges to doors
 - b. Strike plates to frames

- c. Closers to doors and frames.
- 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface hinges to doors
 - b. Closers to doors and frames
 - c. Surface-mounted exit devices
- 4. Spacers or Sex Bolts: for through bolting of hollow-metal doors.

2.22 AIR BARRIERS AND ACCESSORIES

- A. Provide self-adhered, vapor-permeable sheet membrane air barrier and accessory products from a single manufacturer. Provide high temperature air barrier membrane(s) when subject to higher temperatures behind metal flashings and wall components. Subject to compliance with the requirements of this Section, the following manufacturers are acceptable:
 - 1. Henry Products, Inc.:
 - a. Air Barrier Membrane: Blueskin VP™ 160.
 - b. Accessories: membrane for windowsill pan flashings shall be Blueskin® SA, LT, or HT manufactured by Henry; an SBS modified bitumen, self-adhering sheet membrane which is integrally laminated to a blue polyethylene film.
 - c. Self-adhering membrane for all window jambs, headers, inside and outside corners, and other transitions shall be pre-cut BlueskinVP™ 160 manufactured by Henry; a self-adhering sheet air barrier membrane with an engineered film specifically designed to be water resistant and vapor permeable.
 - d. Through-wall flashing membrane (Self-Adhering) shall be Blueskin® TWF manufactured by Henry; an SBS modified bitumen, self-adhering (Yellow) sheet membrane complete with a cross-laminated polyethylene film.
 - 2. Grace Construction Products:
 - a. Air Barrier Membrane: Perm-A-Barrier VPS.
 - b. Water-Based Primer: Perm-A-Barrier WB Primer.
 - c. Solvent-Based primer: Bituthene Primer B-2
 - d. Transition and Detail Membrane: Perm-A-Barrier Flashing.
 - e. Mastics, Adhesives and Tapes: as recommended by manufacturer.
 - 3. VaproShield:
 - a. Air Barrier Membrane: WrapShield SA.
 - b. Window flashing: VaproLiqui-Flash
 - c. Solvent-based Primer:
 - d. Transition Membrane: VaproFlashing
 - e. Mastics, Adhesives and Tapes: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 IN GENERAL

- A. Do not deliver to site or install any material or system, which has not been reviewed and accepted for use on the project.
- B. Comply with the written instructions of the manufacturer and these specifications.
- C. All work shall be made weathertight and the building secure at the end of each day.
- D. Report any damaged or unsuitable areas to the Engineer or Owner's representative immediately.
- E. Do not cut any material with a solvent or dilutant unless approved by the Engineer in writing.
- F. Keep covers tightly sealed on all canned and evaporative products to prevent premature curing.
- G. Clean the demolished surface of all loose debris. Contractor shall provide a smooth even surface for the installation of the new systems.
- H. The Contractor shall install all storefront systems plumb, level and true to the lines and dimensions of the existing wall.

3.2 FLASHING INSTALLATION

- A. Verify that all structural reinforcements have been made to each opening and have been approved by the Owner and/or Engineer.
- B. Install perimeter backer rod and sealant back seals at all cavity and masonry joint locations as shown on the Contract Drawings. Back seal shall be continuous and full width or height of the opening.
- C. Prior to installing flashings, install wood blocking, plywood and shims necessary for the proper installation of the flashings and storefront systems. Wood blocking, plywood and shims shall be beveled and/or chamfered as required to provide solid support and to match existing conditions. Install continuous wood members with the specified fasteners spaced 12" on center maximum.
- D. Install flashings to all properly prepared storefront openings prior to installation of storefront system
- E. All flashings shall be shop fabricated. All bends, breaks and hems shall be clean straight lines. Form flashings to the shapes and configurations shown on the Contract Drawings.

- F. All sill flashings shall turn up 1"-minimum at the backs and ends. Sill flashings shall run continuously across existing sills neatly trimmed and turned up at jamb locations. All seams shall be sealed and overlapped 3" minimum. Set flashings in a full bed of sealant. Install full bead of sealant between storefront frame and rear leg of flashing and between flashing and attachment angle.
- G. All head flashings and cladding shall run continuous from jamb to jamb and shall overlap jamb flashings. Set all head flashings in a full bed of sealant.

3.3 STOREFRONT AND ENTRANCE INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.
- B. Install aluminum framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Utilize two-piece receptors at the head and jamb with sub sills at sill locations. Set sub-sills in full bed of mastic.
- D. Set shims such that they do not interfere with required perimeter sealant joint depth, backer rod or sealant installation.
- E. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- F. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.
- G. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.4 GLAZING INSTALLATION

- A. Install insulating glazing units in the locations designated on the Contract Drawings. Glaze panels in accordance with the storefront manufacturers written instructions.

3.5 SEALANT INSTALLATION

- A. Install sealant at all storefront and entrance perimeters, interior and exterior, where shown on the Contract Drawings and as required for the proper completion of the work.
- B. Clean and prime substrates in strict accordance with sealant manufacturer's requirements.

- C. Precondition sealants to a temperature between 60 and 70 degrees F or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between 60 and 85 degrees F.
- D. Ensure all work by others occurring at sealant joint locations has been completed prior to the start of sealant installation.
- E. Clean all substrates to receive the joint sealant using the manufacturers recommended cleaners and surface preparation techniques.
- F. Ensure all existing sealants and other materials have been removed down to clean sound original substrates. Saw-cut, wire brush, chip, or grind as required to achieve suitable substrates for sealant installation.
- G. All bonding surfaces shall be cleaned with a minimum of two applications of solvent followed by wiping with clean white rags. Solvent shall be applied with brushes and wiped from substrate with rags while it is still wet. Additional application shall be performed if dirt remains after two applications until all dirt is removed.
- H. Joint primer shall be applied to all properly prepared, cleaned and dry substrates. Primer shall be approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.
- I. Primer shall be applied prior to application of joint backer, bond breaker or sealant.
- J. Joint backer shall be installed in all joints as detailed. Joint backing shall be installed with approximately 30% compression at 70 degrees F. Do not stretch, twist, tear or puncture joint backing. Butt joint backings tightly at intersections.
- K. Joint backing shall be installed at the required depth so as not to exceed the joint width/depth ratio recommended for the sealant.
- L. Bond breaker tape shall be installed at locations where backer rod cannot be utilized to achieve the designated joint depth and where shown on the Contract Drawings. Sealant shall adhere only to the sides of the joint and not to the back so as to eliminate three- sided adhesion.
- M. Two-part polyurethane sealant shall be thoroughly mixed including tinting agent in accordance with the manufacturer's printed instructions. Sealant shall have a minimum application life of three (3) hours after mixing.
- N. Unless otherwise required by the sealant manufacturer, the sealant shall be mixed for a period of 6 minutes minimum with a slow speed electrical drill and mixing paddle. The sides of the container shall be repeatedly scraped to ensure adequate mixing.

- O. Sealant shall be applied to clean, dry, joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.
- P. Sealant shall be forced into the joint to completely fill the void and achieve full “wet-out” of the bonding surfaces. Force sealant into the joint and against the sides of the joint. Avoid pulling sealant from sides. All joint sealant shall be immediately tooled to assure full adhesion. Sealant shall be dry tooled, straight, uniform, smooth and neatly finished to the profiles detailed. No soaps, wetting of slicking agents will be allowed.
- Q. Provide weep holes at sill locations spaced 24” on center as shown on the Contract Drawings

3.6 INSTALLATION OF FINISHED HARDWARE

- A. All necessary templates and approved schedules required to fabricate doors, frames and hardware shall be furnished in sufficient time so as not to impede the progress of work.
- B. All hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer’s representative for the item in question, as listed in the hardware schedule.
- C. Mount hardware units at heights indicated in “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute and as required by American with Disabilities Act.
- D. Install each hardware item in compliance with the manufacturer’s instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. All operating parts shall move freely and smoothly without binding, sticking or excessive clearance.
- H. Set thresholds in full bed of butyl-rubber or polyisobutylene mastic sealant.
- I. Lock fronts, flush bolt faces, and strikes shall be beveled, rounded, or rabbeted as required by the contract drawings. The Contractor shall determine and be responsible for the hand and bevel of all doors.

- J. After the hardware has been installed, the manufacturer's representative for locks shall inspect the installation and ascertain that locks are properly secured, keyway correctly positioned and exit devices and latches functioning freely.
- K. The manufacturer's representative for closers shall inspect all closers for proper attachment and correct tension.
- L. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete. Faulty operating, damaged or disfigured hardware shall be replaced by the manufacturer at no additional cost to the Owner.

3.7 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.
- D. Refinish or replace doors damaged during installation.
- E. Re-hang or replace doors that do not swing or operate freely.

3.8 FIELD QUALITY CONTROL

Approximately six months after the date of Substantial Completion, the installer, accompanied by representatives of the manufacturer's latchsets and locksets, door control devices and of other major hardware suppliers, shall return to the Project to perform the following work:

- 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
- 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
- 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.

3.9 HARDWARE SCHEDULE

The following hardware set represents the complete hardware for one opening. The quantity of each set is the responsibility of the contractor.

Hardware Set No. 1

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

2 Door pulls
1 Cylinder
1 Continuous hinges
1 Closer
1 Weatherstripping sets
1 Threshold

END OF SECTION

I:\837920\02 Design\specs\837920 08 50 00 Storefronts and Entrances.doc

EXTERIOR PAINTING

SECTION 09 90 00

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 SCOPE OF WORK

In general, the Contractor shall supply all labor, transportation, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:

General:

- A. Provide temporary protection of the existing parking facilities components designated to remain, and to prevent overspray to adjacent areas.
- B. Clean rusted areas of painted steel with wire steel brush to remove rust and expose clean steel surfaces. Areas requiring cleaning include railings and handrails located within the stair towers.
- C. Prime and paint steel railings and handrails within the stair towers to match the existing color (green).
- D. Scrape, prime, and paint rusted lintels at locations as indicated on the Contract Drawings.
- E. Clean and restore all areas affected by the work.

1.3 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all barriers, protection, warning lines, lighting and personnel required to segregate the work area(s) and to prevent damage to the facilities, their occupants and the surrounding landscaped and paved areas. All applicable OSHA and D.L.W.D. requirements shall be observed by the Contractor.

- B. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks, and excessive heat.
- C. The Contractor shall provide and equip as much labor force as is necessary to complete the project within the Contract period and in accordance with the Contract Documents without sacrificing workmanship quality.
- D. The Contractor shall coordinate with the maintenance staff the daily shutdown of all air intake units in the work areas or possibly affected by the construction fumes, odors or air-borne debris. The Contractor will install plastic sheeting and duct tape over the removed equipment opening prior to initiating work each day. The plastic sheeting shall be removed by the Contractor at the end of each work day.
- E. All debris, dust and dirt, shall be swept clean from all exterior and interior surfaces affected by the work. Any finishes which are damaged, soiled or affected by the work shall be cleaned, repaired, or replaced by the Contractor with a system equal in color, texture, and finish at no additional cost to the Owner.
- F. Any open ducts, electric boxes or similar fixtures and items which can be soiled or affected by the work shall be masked, protected, and cleaned by the Contractor at no additional cost to the Owner.
- G. SSPC-QP-1 Certification is not a requirement for this project.

1.4 SUBMITTALS

- A. Submit three sets of manufacturer's specifications and complete range of manufacturer's color chips. Cross reference color samples to color schedule as indicated in this Section.
- B. Prepare samples as requested by the Engineer.
- C. For each type of coating, sealant, or other product furnished, submit data from the manufacturer's paint laboratory indicating that the product conforms to requirements of the referenced specification.
- D. Submit Manufacturer's material safety data sheets for coatings, solvents, and other potentially hazardous materials.
- E. If a product proposed for use does not conform to requirements of the referenced specification, submit for approval to the Owner, evidence from the paint manufacturer's laboratory that the proposed product is either equal to or better than the product specified. The submittal shall include the following:
 - 1. Identification of the proposed substitute;
 - 2. Reason why the substitution is necessary;
 - 3. A comparative analysis of the specified product and the proposed substitute, including tabulations of the composition of pigment and vehicle;

4. The differences between the specified product and the proposed substitute; and
5. Other information necessary for an accurate comparison of the proposed substitute and the specified product.

1.5 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH TLV-BKLT (1991-1992) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)

ACGIH TLV-DOC Documentation of Threshold Limit Values and Biological Exposure Indices

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 7396 (2014) Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1000 Air Contaminants

29 CFR 1910.1025 Lead

29 CFR 1926.62 Lead Exposure in Construction

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-2246 Paint, Latex (Gloss, Interior)

CID A-A-2336 (Rev. A) Primer Coating (Alkyd, Exterior Wood, White and Tints)

CID A-A-2904 Thinner, Paint, Mineral Spirits, Regular and Odorless

CID A-A-2994 Primer Coating, Interior, for Walls and Wood

CID A-A-3067 Paint, Alkyd, Exterior, Low VOC

CID A-A-50557 Primer, Water-Borne, Acrylic or Modified Acrylic, For Metal Surfaces

CID A-A-50570 Paint, Water-Borne, Acrylic or Modified Acrylic,
Semigloss, for Metal Surfaces

FEDERAL STANDARDS (FED-STD)

FED-STD-313 (Rev. C) Material Safety Data, Transportation Data and
Disposal Data for Hazardous Materials Furnished to
Government Activities

FEDERAL SPECIFICATIONS (FS)

FS TT-P-19 (Rev. D; Am. 1) Paint, Latex (Acrylic Emulsion, Exterior
Wood and Masonry)

FS TT-E-489 (Rev. J) Enamel, Alkyd, Gloss, Low VOC Content

FS TT-P-641 (Rev. G; Am. 1) Primer Coating, Zinc Dust-Zinc Oxide
(For Galvanized Surfaces)

FS TT-P-664 (Rev. D) Primer Coating, Alkyd, Corrosion-Inhibiting,
Lead and Chromate Free, VOC-Compliant

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Guide 6 (1995) Containing Debris Generated During Paint
Removal Operations

SSPC Guide 7 (1995) Disposal of Lead-Contaminated Surface
Preparation Debris

SSPC PA 1 (1991) Shop, Field, and Maintenance Painting

SSPC PA 3 (1995) Safety in Paint Application

SSPC VIS 3 (1995) Visual Standard for Power-and Hand-Tool
Cleaned Steel (Standard Reference Photographs)

SSPC SP 1 (1982) Solvent Cleaning

SSPC SP 2 (1995) Hand Tool Cleaning

SSPC SP 3 (1995) Power Tool Cleaning

SSPC SP 12 (1995) Surface Preparation and Cleaning of Steel and
Other Hard Materials by High-and Ultrahigh-Pressure
Water Jetting Prior to Recoating

| | |
|----------------|--|
| SSPC Paint 20 | (1991) Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") |
| SSPC Paint 23 | (1991) Latex Primer for Steel Surfaces |
| SSPC Paint 104 | (1991) White or Tinted Alkyd Paint |

1.6 PACKAGING, LABELING, AND STORAGE

- A. Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F. Volatile liquids will not be stored on site without prior approval from the Owner.

1.7 WARRANTY

- A. Work shall be left complete, free from defects and hereby warranted that it will not discolor, fade, craze or peel off within a period of two (2) year after acceptance. Repair all work developing imperfections in that time at no expense to the Owner.

PART 2 - PRODUCTS

2.1 EXTERIOR PAINTS

- A. All paint materials shall be products of a recognized reliable manufacturer and shall be of the best quality and grade (1st line) for each type. All paint materials shall be lead free.
- B. Paint to be used for coating shall be a 100% acrylic emulsion, water borne, corrosion resistant coating specifically manufactured for use on exterior metal surfaces such as RD Elastometal as manufactured by RD Coatings. Equal materials manufactured by the Thneme Company or LPL Industries will be considered should they meet the performance requirements. Colors shall be as selected by the Owner to match existing coated surfaces, and as described within this Section.
- C. Primer for use over existing paint coatings and bare metal surfaces, shall be rust inhibitive in nature and as required by the paint manufacturer of existing surfaces encountered and shall be specifically manufactured and recommended by the paint manufacturer for the surface being painted.
- D. Paint thinner shall be as recommended by the paint manufacturer.

- E. Unspecified materials: All unspecified materials such as shellac, turpentine, or linseed oils shall be of the "best grade" or "first line" made by reputable, recognized manufacturers and shall bear the labels and be approved by the Designer.
- F. Coatings to be applied in properly prepared steel shall be as recommended by the paint manufacturer.

2.2 PAINTS AND COATINGS FOR EXISTING STEEL LINTELS

- A. All paint materials shall be products of a recognized reliable manufacturer and shall be of the best quality and grade (1st line) for each type. To establish a standard of quality, painting materials shall be supplied from the following manufacturers. Only top-quality materials are to be used on the project. Where a question of quality occurs, the Contractor will submit an affidavit from the materials manufacturer stating the quality range of the product to be used, as compared to other top-quality products made by that manufacturer.
 - 1. Tnemec Co., Inc.
 - a. Primer: ST Typoxy Series N27
 - b. Paint: Endure Shield Series 73
 - 2. Rust Oleum
 - a. Primer: 9100 Rust-O-Poxy
 - b. Paint: 9700 Rust-O-Thane
 - 3. Dupont Coatings:
 - a. Primer: Corlar 25P Epoxy Mastic
 - b. Paint: Impron 333 Polyurethane Enamel
 - 4. Or approved equal.
- B. Final color for steel to be painted shall be selected by the Owner.
- C. Number of paint coats:
 - 1. Primer: One coat, dry film thickness, 5-8 mils
 - 2. Paint: Two coats, dry film thickness 2 mils

PART 3 - EXECUTION

3.1 GENERAL

- A. Surfaces to receive paint shall meet the requirements established by the manufacturer of the paint and these specifications.
- B. Surfaces to receive paint shall be examined and work shall not be started until defects have been corrected.
- C. Verify that all sealants, putties and glazing compounds have cured for the specified time prior to applying new coatings.

- D. Spaces in which painting is being done shall be properly identified with "Wet Paint" signs or closed to traffic until paint is dry.
- E. Install polyethylene sheeting around adjacent areas of the parking facility.
- F. Provide adequate ventilation.

3.2 WORKMANSHIP

- A. Employ skilled mechanics to ensure the very best workmanship. Quality workmanship is required. Materials to be applied by craftsmen experienced in the use of the particular product involved.
- B. All surfaces shall be properly smoothed. All surfaces shall be properly prepared, clean and dry when a coating is applied. Any bare or abraded spots in base coats shall be touched up before next coat is applied.
- C. Protection against fire shall be taken and all oily rags or waste must be removed from the facilities each day.
- D. Color of each coat of paint shall be reviewed and accepted by the Owner as it goes on and prior to subsequent applications. Unless otherwise noted, all surfaces to be painted shall receive one prime coat, and two finish coats, or as required to provide a uniform appearance.

3.3 ENVIRONMENTAL CONDITIONS:

- A. Air and surface temperatures shall be between 50°F and 100°F during application of paints and coatings.
- B. Relative humidity shall not be higher than 80%, and surface temperature shall be a minimum of 5°F above the dew point.
- C. Wind velocity shall be less than 15 MPH for exterior painting with no visible atmospheric dust.
- D. Salamanders and open fires are prohibited from the work site.
- E. Surfaces to be painted shall be fully dried, cured, or otherwise set to receive the coatings prior to application.

3.4 PROTECTION OF AREAS AND SPACES

- A. Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen

skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.5 SURFACE PREPARATION

- A. Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Surfaces to be painted shall be clean before applying paint or surface treatment. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fail on wet, newly painted surfaces. Before painting, the Contractor shall remove hardware accessories, plates, and similar items or provide ample protection of such items. Upon completion of each space, the Contractor shall replace above items.
- B. Ferrous Metal: Removal of loose rust, loose mill scale, and loose paint to degree specified, by power tool chipping, scraping, sanding, and wire brushing as necessary to receive paint in accordance with the Structural Steel Painting Council (SSPC-3 Specifications) and the paint manufacturer. Fill dents and depressions with Auto body putty and sand smooth. Touch up any chipped or abraded placed on items that have been shop coated. All welds exposed in finished surfaces to be ground smooth by fabricator. Where steel and iron have a heavy coating of scale, it shall be removed by de-scaling or wire brushing as necessary to produce a satisfactory surface for painting.
- C. Existing coated surfaces with no defects: Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:
 - 1. Wipe previously painted surfaces to receive solvent-based coatings, clean with a clean, dry cloth saturated with mineral spirits. Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
 - 2. Sand existing enamel and other glossy surfaces to remove gloss. Brush, and wipe clean with a dry cloth.
 - 3. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer.
- D. Existing Coated Surfaces with Minor Defects: Sand, fill, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings.
- E. Removal of Existing Coatings: Remove existing coatings from the following surfaces:
 - 1. Loose and scaling paint and/or rust shall be removed in order to properly prepare the steel surfaces per the manufacturer's requirements at designated bollards.

- F. Substrate Repair:
1. Repair substrate surface damaged during coating removal;
 2. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal;
 3. Clean and prime the substrate as specified.
 4. 6 degree of cleanliness to remove existing coating.

3.6 APPLICATION OF PAINT

- A. Finishing materials shall be free from skins, lumps or any foreign matter when used, and shall be kept well stirred while being applied.
- B. Each finish coat paint shall be evenly applied and allowed to dry before any subsequent coat is applied. Each coat shall be applied in accordance with the manufacturer's requirements and recommendations. The finished work shall be free from runs, sags, defective brushing and clogging of lines or angles. Drying time between coats of paint shall be in accordance with the manufacturer's requirements.
- C. Unless otherwise noted, all surfaces to be painted shall receive the followings
1. Full Prime Coat: RD Elastometal or approved equal to all prepared surfaces at 6.0-7.0 mils dft.
 2. 2-Full Finish Coats: RD Monoguard or approved equal to all primed surfaces at 3.0-4.0 mils dft. Per coat, color to be approved by Owner.
- D. Spray painting will not be allowed unless approved in writing by the Engineer.
- E. All materials shall be applied in accordance with manufacturers' recommendations.
- F. Do not allow primers or intermediate coats to dry more than 30-days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- G. Apply coatings with approved brushes or approved rollers, unless specified otherwise. Spray areas made inaccessible to brushing by items such as ducts and other equipment.
- H. Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory for the type of paint being used. Obtain written permission from the Owner to use thinners. The written permission shall include quantities and types of thinners to use.

3.7 PAINTING OF STEEL LINTELS

- A. Surfaces to be painted shall be cleaned before applying paint or surface treatment. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100°F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.
- B. All surfaces shall be properly smoothed. All surfaces shall be properly prepared, clean and dry when a coating is applied. Any bare or abraded spots in base coats shall be touched up before next coat is applied.
- C. Carry water required to mixing area and dump all water materials outside the building in a refuse receptacle provided by the Contractor. Be accountable for any and all damage resulting from failure to observe the provisions of this Specification. Protection against fire shall be taken and all oil rags or waste must be removed from the building each day.
- D. Finishing materials shall be free from skins, lumps or any foreign matter when used, and shall be kept well stirred while being applied.
- E. Each coat of finish shall be evenly brushed out and allowed to dry before any subsequent coat is applied. Each coat shall be a different tint from that of the preceding coat and may be reviewed by the Owner before the next coat is applied. Finish coats shall be the exact shade and textures selected. The finished work shall be free from runs, sags, defective brushing and clogging of lines or angles. Drying time between coats of paint shall be in accordance with the manufacturer's labeled instructions. Spray painting will not be allowed. All materials shall be applied in accordance with manufacturer's recommendations.
- F. Repair brush marks, scratches, abrasions, and minor surface defects in coatings finish in accordance with manufacturer's printed instructions. Finish of repaired surfaces shall be uniform and free from blemishes and variations in color and surface texture.

3.8 CLEAN-UP

- A. All adjacent areas, damaged or stained by the installation of the new work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.
- B. The Contractor shall not demobilize the site until the completed work is toured by the Owner and Designer. Any unsatisfactory items observed will be reported in "punch-list" form. These items shall be corrected immediately by the Contractor prior to demobilization from the job site.

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

- C. All barriers, temporary facilities and the like shall be removed upon completion of the work. Areas damaged as a result of the Contractors equipment shall be restored to their original condition, all to the satisfaction of the Owner.

END OF SECTION

I:\837920\02 Design\specs\837920 09 90 00 - Exterior Painting.docx

This Page Intentionally Left Blank.

PLUMBING FILED SUB-BID REQUIREMENTS

SECTION 22 00 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Masonry Work" include all of the following listed Specification Sections in their entirety.

SECTION - 01 22 00 - UNIT PRICES

SECTION - 22 30 00 - PLUMBING

- D. The Work of this section is shown on Drawings

A101, S101, S102, S103, S104, S105, S106, S107, S108, S109, S110, S111, S112, S113, S114, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S502

E. SUB-SUBS

1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE
2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\837920 22 00 00 Plumbing (Filed Sub-Bid).docx

PLUMBING

SECTION 22 30 00

(Filed Sub-Bid with Section 22 00 00)

PART 1 – GENERAL

1.1 IN GENERAL

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 01 30 – Maintenance of Cast-In-Place Concrete
- B. Section 07 18 00 – Traffic Coatings
- C. Section 07 92 00 – Joint Sealants

1.3 SCOPE OF WORK

- A. In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice. The work under this Section generally includes the following:
 - 1. Remove all existing deck drains, clamping rings, strainers and bowls from concrete deck as indicated on the Contract Drawings and prepare to receive new drain system.
 - 2. Install new cast-iron deck drain bowls, underdeck clamping rings, extension collars, clamps, no-hub connections or lead and oakum joints.
 - a. Route, snake, and scope all drains to nearest manhole / drain out exit location to achieve a free-flowing system. Perform at beginning of waterproofing operations and after substantial completion. Water test deck drains to prior to demobilization.
 - b. At conclusion of the project the contractor shall verify all deck drains are free flowing by having a recorded video feed of the plumbing lines.
 - 3. Install new drain bowl assemblies, including bowls, strainers, clamping rings, underdeck clamps, and lead and oakum joints at existing penthouse roof drain locations.
 - 4. Coordinate to replace, patch, seal, and repair all existing construction assemblies removed, damaged, or cut to allow for the installation of the new drain bowl assemblies. Repaired areas shall match the surrounding existing construction.

5. Provide all temporary protection, tools, and equipment necessary to remove and replace the existing drains and leaders as specified for the proper installation of the new deck drains.
6. Remove and replace deteriorated drain pipe leader line on a Unit Price basis.
7. Clean and restore all areas affected by Work to the satisfaction of the Owner.

1.4 JOB CONDITIONS

- A. Protect all new and existing deck work, the building and its contents from damages. Segregate all work areas from the building occupants.
- B. The Contractor is cautioned to take all necessary precautions and make all investigations necessary to install the work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.
- C. The Contractor shall provide all the necessary warning lines required to segregate the work areas and to protect the occupants from plumbing operations.
- D. The plumbing shall be performed by licensed tradesmen.

1.5 SUBMITTALS

- A. The Contractor shall submit project literature and samples for the items listed in this section in accordance with Section 01 33 00 – Shop Drawings and Submittals.

1.6 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to repair to replace components that fail in materials or workmanship. The warranty shall be for a period of five (5) years.

PART 2 - MATERIALS

2.1 DRAINS AND ASSEMBLIES

- A. Replacement drains shall be required to match the existing diameter and as manufactured by Josam, Zurn, Wade, Smith or approved equal. Replacement drain outlet diameters shall match the existing. Drain assemblies shall have non-puncturing cast iron clamping ring. All floor drain assemblies shall be installed with an underdeck clamps. Drain strainers shall be cast iron, vandal resistant, of suitable size and configuration as provided by the drain manufacturer.
- B. All accessories necessary for the proper installation of the new drain bowl assemblies, including but not limited to underdeck clamps, and strainers shall be of the same manufacturer as the drain bowls and be completely compatible with the existing piping and surrounding materials. Drain sump caulking shall be as recommended by the supplier.

- C. No-hub connections shall be neoprene sleeves with a minimum of two (2) stainless steel hose clamps per side to be clamped.
- D. All required hangers and fittings for cast iron pipe shall conform to Manufacturer's Standardization Society of Valve and Fittings Industry (MCC) SP-58 and SP-59 guidelines. Hangers and strapping material shall be of approved material that will not promote galvanic reaction. Cast iron fittings shall conform to the American Society of Mechanical Engineers (ASME) B16.4 and B16.12.

2.2 PIPE EXTENSION CONNECTIONS

- A. Provide no-hub connections with stainless steel bands for pipe extensions. No-hub connection to conform to CISPI 310 and ASTM C 1277. Gaskets are made from an elastomeric compound that meets the requirements of ASTM C 564. For pipe 10-inches and smaller in diameter provide 60 in.-lbs. of installation torque minimum.
 - 1. Stainless steel bands: Type 301 AISI Stainless Steel – Minimum tensile strength 165,000 psi - minimum two (2) per side to be clamped
 - 2. Screw housing: Type 301 AISI Stainless Steel
 - 3. Screw: Type 305 AISI Stainless Steel, 5/16" hex head slant shoulder
 - 4. Shield: Type 301 AISI Stainless Steel - Bright annealed; Rockwell B-85 minimum
 - 5. Sealing sleeve (gasket): High quality Neoprene elastomer compound, durometer 70+/- 5 per ASTM D2240

PART 3 - EXECUTION

3.1 GENERAL

- A. All work in this Section shall be coordinated with the deck repair work. All required work at drain locations shall be properly protected at all times from equipment and traffic.
- B. The Contractor is cautioned to investigate all existing conditions and materials of construction. All replacement items, including but not limited to clamps and strainers must be completely compatible and match the existing system.
- C. Clean all new drain assemblies thoroughly of dust, dirt, debris, and bituminous materials prior to the installation of the replacement membrane system.

3.2 REMOVAL OF EXISTING DRAIN COMPONENTS

- A. Remove the existing designated deck drain components from the existing drain bowl assemblies so as to cause minimum damage to the deck and existing plumbing components.
- B. The Contractor shall provide all interior and deck protection.

3.3 REPLACEMENT DRAIN COMPONENTS

- A. Install all replacement deck drains such that the metal drain grate is level with the concrete deck surface. See detail drawings for assembly position.
- B. Should it be required, complete all cuts through the existing deck so as to cause as little damage as possible to the deck and associated building components. Cut shall be as small in size as possible. Methods of deck removal shall be submitted by the Contractor and approved by the Engineer prior to demolition. The Contractor shall provide all interior protection.
- C. Make all drain to leader connections watertight and of sufficient strength. Place drain outlet tube within existing leader pipe and overlap at least 1".
 - 1. Lead and oakum joints: Pack joint tightly with oakum of sufficient size to remain firmly in place.
 - 2. Mechanical joint couplings shall be installed in accordance with the manufacturer's instructions.
 - 3. Tamp joint tight as required.
- D. All drains installed shall be completed and flashed in the same day's operation.
- E. Check all drain and leader pipe joints with a water test once flashing is complete to check for leaks. Repair all leaks to the satisfaction of the Owner.

3.4 CLEANING OF DRAINAGE SYSTEM

- A. After the new replacement system has been installed, clear all deck drain leader piping of debris and clogs such that the system is free-flowing.
- B. The Contractor shall notify the Engineer and Owner a minimum of 72 hours in advance prior to cleaning the drainage system, in order to allow the Engineer and Owner to be present during the cleaning operations.
- C. The Contractor shall clear the existing leader pipe with "Roto-rooter" type equipment from the deck level to the point where the leader pipe exits the building, or 75 feet minimum. Flush the drain line with water upon completion of the cleaning.
- D. Contractor shall provide a recorded video feed of each drain line via portable plumbing camera. Recorded videos shall be provided to the Owner on disk of flash drive as part of the close-out documents.

3.5 CLEAN-UP

All floor and adjacent areas, both interior and exterior, damaged or stained by the installation of the plumbing work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.

3.6 WATER TESTS

Perform water tests on drain assemblies, including leader piping. Notify the Owner 48-hours minimum prior to water tests in order that the Owner/Owner's representative may witness testing. Using a ¾-inch garden hose run water into the drainage components for thirty minutes. Inspect all drainage components for leakage and repair as required. Inform Owner of test findings.

END OF SECTION

I:\837920\02 Design\specs\837920 22 30 00 - Plumbing.docxs

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

This Page Intentionally Left Blank.

ELECTRICAL FILED SUB-BID REQUIREMENTS

SECTION 26 00 00

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All of the Contract Documents, including General and Supplementary conditions and Division 0 – Bidding Documents, Contract Forms and Conditions of the Contract and Division 1 – General Requirements, apply to the work in this Section
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification's sections and other Contract Documents
- C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications

1.2 REQUIREMENTS FOR SUBMITTING FILED SUB-BID

- A. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
- B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a Current DCAMM sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.
- C. Specification requirements for the Filed Sub-bid "Masonry Work" include all of the following listed Specification Sections in their entirety.

SECTION - 26 05 10 - ELECTRICAL SPECIAL CONDITIONS

SECTION - 26 05 20 - BASIC MATERIALS AND METHODS

SECTION - 26 05 30 - WIRING METHODS

SECTION - 26 20 10 - LOW VOLTAGE DISTRIBUTION

- D. The Work of this section is shown on Drawings

E000, E101, E102

- E. SUB-SUBS

Renovation and Repair of the
George A. Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

1. Sub-sub bids are required for this Section. Sub-Bidders shall include the appropriate information for the list of sub sub-bid Class of Work noted below in this paragraph. NOT APPLICABLE
2. If the Filed Sub-Bidder customarily performs the above Work with its own workforce, the Sub-Bidder should list its own name and trade and leave the dollar amount blank.
3. If the Filed Sub-Bidder does not customarily perform the Classes of Work with its own workforce, the Sub-Bidder should list the name of the contractor performing the work, the trade and insert a dollar amount.

END OF SECTION

I:\837920\02 Design\specs\RW Sullivan Spec 100% Submission\837920 26 00 00 Electrical Filed Sub-Bid Requirements.docx

SECTION 26 05 10
ELECTRICAL SPECIAL CONDITIONS
(PART OF 260000 TRADE BID)
FILED SUB-BID

TABLE OF CONTENTS

PART 1 – GENERAL

| | | |
|------|--|----|
| 1.1 | GENERAL PROVISIONS | 1 |
| 1.2 | RELATED DOCUMENTS | 1 |
| 1.3 | DESCRIPTION OF WORK | 1 |
| 1.4 | RELATED WORK | 3 |
| 1.5 | UL LISTING | 3 |
| 1.6 | QUALITY ASSURANCE | 3 |
| 1.7 | WARRANTY | 4 |
| 1.8 | DEFINITIONS | 5 |
| 1.9 | THE SUBCONTRACTOR | 6 |
| 1.10 | COORDINATION OF WORK | 7 |
| 1.11 | EQUIPMENT ACCESS | 9 |
| 1.12 | EQUIPMENT AND MATERIALS | 9 |
| 1.13 | USE OF PREMISES | 10 |
| 1.14 | PROTECTION | 10 |
| 1.15 | DAMAGE TO OTHER WORK | 11 |
| 1.16 | CORRECTION OF WORK | 11 |
| 1.17 | EXTRA WORK | 11 |
| 1.18 | TOUCH-UP PAINTING | 11 |
| 1.19 | TRAINING AND OPERATION AND MAINTENANCE MANUALS | 11 |
| 1.20 | RECORD DRAWINGS/AS-BUILT DRAWINGS | 13 |
| 1.21 | SHOP DRAWING SUBMITTALS | 14 |

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

| | | |
|-----|-------------------------------------|----|
| 3.1 | COOPERATION AND WORK PROGRESS | 15 |
| 3.2 | INSTALLATION | 17 |
| 3.3 | MATERIALS AND WORKMANSHIP | 18 |
| 3.4 | CLEANING | 19 |
| 3.5 | FINAL INSPECTION | 20 |

SECTION 26 05 10

ELECTRICAL SPECIAL CONDITIONS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications, including Construction Manager's Supplemental Instructions.
- B. Publicly Bid Trade Contractor: The work of this section is work of a Publicly Bid Trade Contractor and includes the following requirements:
 - 1. Submit bid as directed by and in compliance with the Request for Proposals, the Instructions to Bidders and this Paragraph 1.0.
 - 2. Submit bid on the bid form provided in the Project Manual.
 - 3. Submit bid the manner described in the Instructions to Bidders and before the date and time indicated for submission of bids.
 - 4. The Trade Contractor shall perform the complete trade work, including sub-trade classes of work, with employees on its own payroll unless the Trade Contractor identifies on the Bid Form, the name of a sub-trade subcontractor that will perform each of the following classes of sub-trade work and the corresponding sub-trade subcontract sum.
- C. If the Trade Contractor intends to use sub-trade subcontractors to perform any portion of the trade work other than the customary sub-trade classes of work listed in Description of Work herein below, the Trade Contractor shall list on the bid form the names of each such sub-trade subcontractor and each respective sub-trade subcontract sum unless: (a) the value of the subtrade subcontract is less than Twenty-Five Thousand Dollars (\$25,000), or (b) the sub-trade subcontract is not subject to the provisions of G.L. c. 149, §§ 44A-J.

1.2 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 01 - General Requirements, shall be included in, and made part of, this Section.

1.3 DESCRIPTION OF WORK

- A. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.
- B. The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
- C. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- D. The specifications and drawings describe the minimum requirements that must be met by the Electrical Subcontractor for the installation of all work as shown on the drawings and as specified here-in-under and in other Division 26 Sections. The following major items of work are included under Divisions 26:
 - 1. Electrical connections to equipment.
 - 2. Cleaning, Testing and adjustment of equipment.
 - 3. Phasing of construction.
 - 4. Permit fees, etc.
 - 5. Firestopping, fire-proofing , smoke stopping and waterproofing of all electrical equipment where required.
 - 6. Hangers, supports, mechanical channels and all appurtenances required for installation of electrical equipment.
 - 7. Conductors.
 - 8. Surface raceways
 - 9. Conduits, fittings and connectors, including supports.
 - 10. Pull boxes.
 - 11. Junction Boxes and Backboxes.
 - 12. Wireways.
 - 13. Electrical identification including, but not limited to, disconnect switches, panels, conduit and conductors, etc.
 - 14. Panelboards.
 - 15. Dry-Type Transformers.
 - 16. Grounding.
 - 17. Fuses.
 - 18. Fused and Unfused Disconnect Switches.
 - 19. Circuit Breakers.
 - 20. Shop Drawing Submittals.
 - 21. Coordination Drawings.
 - 22. Record As-Built Drawings.
 - 23. Operation and Maintenance Manuals.
 - 24. System Start-Up, Demonstration and Training.

1.4 RELATED WORK

A. Related Work Under Divisions 26.

1. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the following Sections:
 - a. Section 260520 – Basic Materials and Methods
 - b. Section 260530 – Wiring Methods
 - c. Section 262010 – Low Voltage Distribution

B. Drawings:

1. Reference Drawings:
 - a. E000 – Electrical Legend and General Notes
 - b. E101 – Downes Garage – Level 1 – Electrical Plan
 - c. E102 – Ayotte Garage – Level 2 – Electrical Plan
2. Reference Architectural drawings for related scope and coordination items.

1.5 UL LISTING

- A. Furnish UL listed and labeled equipment , devices, and materials. Where a UL listing is not available, submit the test reports of an independent testing engineer indicating that equipment is in conformance with local and state codes. Tests and inspections required for approval shall be performed at no additional cost to the Owner.

1.6 QUALITY ASSURANCE

- A. The manufacturers listed within these specifications have been pre-selected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. Electrical Subcontractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
- C. Where equipment of a substitute manufacturer differ from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Subcontractor responsible for the substitution to modify the installation of the equipment/system to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the Electrical Subcontractor shall submit drawings showing the proposed,

substitute installation. If the proposed installation is accepted, the Electrical Subcontractor shall make all necessary changes in all affected related work provided under his and other Sections including location of roughing-in connections by other Trades, conduit, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be responsible to assure that the Subcontractor responsible for the substitution bears the cost arising to all other Trades as a result of the substitution. A 'Substitution Request Sheet' shall be submitted by the Contractor for all substituted equipment.

1. The 'Substitution Request Sheet' shall be copied on to the Contractor's letterhead, filled out, signed and sealed by an Authorized Officer of the Corporation then submitted to the architect to be approved prior to any substitutions being considered, including all "Or Equals" by manufacturers' not listed in the specifications. Refer to end of this specification section for 'Substitution Request Sheet'.

- D. Unless specifically indicated otherwise, all equipment and materials required for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

1.7 WARRANTY

- A. Refer to provisions of the General Requirements in Division 01 regarding warranties for work under this Contract.
- B. All warranties shall begin on the Date of Substantial Completion of the entire project or the Owner's acceptance of the workmanship and/or material covered by the warranty, whichever is later. The warranty coverage shall continue for the specified period. Refer to individual specification sections for warranty period. If no specific warranty period is specified, the warranty shall extend for a minimum of 365 days.
- C. Manufacturers shall provide their standard warranties for work under the Electrical Trades. However, such warranties shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and Electrical Subcontractor may have by law or by other provisions of the Contract Documents.
- D. All materials, items of equipment and workmanship furnished under the Electrical Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Electrical Subcontractor for the work under his

Contract, including all other damage done to areas, materials and other systems resulting from this failure.

- E. The Electrical Subcontractor shall warranty that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- F. Upon receipt of notice from the Owner or Architect of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the Electrical Subcontractor for his work or any other work affected by the failure(s).
- G. Electrical Subcontractor shall furnish, before the final payment is made, a written warranty covering the above requirements in accordance with the General Requirements.

1.8 DEFINITIONS

- A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
- B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.
- C. Wherever the term "provide" is used in the specifications it will mean "furnish" and "install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the specifications.
- D. Wherever the term "material" is used in the specifications it will mean any "product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- E. The terms "approved", or "approval" shall mean the written approval of the Architect. Where indicated in the product section of the specifications, "Approved Equal" shall mean the proposed substitute product must be approved by the Owner, Architect and Engineer in writing prior to acceptance on the project for submission. Basis of approval of a substitute product submitted for "Approved Equal" shall be at the sole discretion of the Owner, Architect and Engineer.
- F. The term "Contract Documents" shall mean the entire set of Drawings and Specifications as listed in the Table of Contents of the General Conditions including all bound and unbound material and all items officially issued to date such as addenda, bulletins, job modifications, etc.

- G. The term "specification" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.
- H. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed", and similar words shall mean the direction, requirement, permission, order, designation or prescription of the Architect; the terms "approved", "acceptable", "satisfactory", and similar words shall mean approved by, acceptable or satisfactory to the Architect; and, the terms "necessary", "reasonable", "proper", "correct", and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.
- I. "Accessible" indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, etc. to gain access. "Accessible ceiling" indicates acoustic tile type hung ceilings. Concealed spline or sheetrock ceilings with access panels shall not be considered accessible ceilings.
- J. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.
- K. "Exposed" means not installed underground or "concealed" as defined above.
- L. "Electrical Subcontractor" refers to the Subcontractor responsible for furnishing and installation of all work indicated on the Electrical drawings and in the Electrical specifications.
- M. "Other Work Contractor" (O.W.C.) refers to the Contractor(s), or Subcontractor(s) performing work under other Sections of the Contract Documents.

1.9 THE SUBCONTRACTOR

- A. The Electrical Subcontractor shall visit the site of the proposed new facility and base his bids from his own site examinations and estimates. The Electrical Subcontractor shall not hold the Architect, Engineer, Owner or their agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. The Electrical Subcontractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems and coordinating the work with the other Trades and existing building conditions.
- B. The Electrical Subcontractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.

- C. The Electrical Subcontractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the Electrical Subcontractor shall perform their work according to all the conditions as set forth in these specifications.
- D. The Electrical Subcontractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the Architect. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated in the Contract Documents (Architectural, HVAC, Plumbing, Fire Protection, etc.). Unless specifically indicated otherwise, all work and materials furnished and installed shall be new, unused and of the best quality and workmanship. The Electrical Subcontractor shall cooperate with the Architect so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.10 COORDINATION OF WORK

- A. The Electrical Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the electrical work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Electrical Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Electrical Subcontractor or that of any other trade caused by the Electrical Subcontractor's neglect, shall be made by him at his own expense, and to the Architect's satisfaction.
- D. The Electrical Subcontractor shall include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project MAY require additional time to coordinate all Trades and allow implementation of the Owner's Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of conduits, boxes distribution equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Electrical Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system

component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.

- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Electrical Subcontractor shall provide elbows, conduit bends, "LB" fittings, offsets in busway, etc. as required for his work to effect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) of pull and junction box covers, wiring, lighting fixtures, and all other system components provided under this Contract requiring periodic replacement or maintenance. All pull and junction boxes shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect at no cost to the Owner.
- I. The Contract Drawings are diagrammatic only intending to show general runs and locations of conduits, distribution equipment, lighting fixtures, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
- J. Where discrepancies in scope of work as to what Trade provides items, such as starters, disconnects, flow switches, etc., exist, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Electrical Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- K. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict and where feeders, branch circuits or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Electrical systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract

as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

- L. Final location of all lighting fixtures, smoke detectors, exit signs, switches, receptacles, fire alarm devices, etc., shall be coordinated with the Architectural reflected ceiling plans, architectural elevations, and/or other Architectural details, as applicable and shall not be scaled from locations indicated on the electrical drawings. Obtain approval of locations of all devices from Architect in the field. The Owner/Architect reserves the right to relocate any receptacle, device, lighting fixture, etc. 10'-0" in any direction prior to installation at no additional cost to the Project.
- M. Electrical connections to all kitchen equipment or other type equipment shown on the Electrical and/or Architectural drawings that are to be provided with services, shall be included under this Contract as applicable, including all conduit and wiring connections to systems, to make equipment complete and operable. Additional wiring, equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Electrical Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.
- N. The Electrical Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment.

1.11 EQUIPMENT ACCESS

- A. Electrical Subcontractor shall keep himself fully informed as to the shape, size and position of all openings required for his equipment and shall give information to the General Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance.

1.12 EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces. Equipment such as switchgear with heater elements installed shall have the heater elements energized after the equipment is received by the Electrical Subcontractor.
- B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work,

equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the Electrical Subcontractor's expense.

- C. The Electrical Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.
- D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Electrical Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- E. All equipment of one type (such as distribution equipment, cable, wiring devices, fire alarm system, etc.) shall be the products of one manufacturer.
- F. Equipment pre-purchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the Electrical Subcontractor, shall be received, installed, tested, etc., as if the equipment was purchased by the Electrical Subcontractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.13 USE OF PREMISES

- A. The Electrical Subcontractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Architect and he shall not encumber the premises with his materials. The Electrical Subcontractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.
- B. Notwithstanding any approvals or instructions which must be obtained by the Electrical Subcontractor from the Architect in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the Electrical Subcontractor. The Architect, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.14 PROTECTION

- A. Materials, conduit, lighting fixtures, switchgear, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems

provided under the Electrical Contract, prior to completion of work and acceptance of all systems by the Owner except as otherwise instructed by Architect. Take precautions to protect all materials furnished from damage and theft.

- B. The Electrical Subcontractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or electrical systems provided under his Contract.

1.15 DAMAGE TO OTHER WORK

- A. The Electrical Subcontractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, conduits, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the Electrical Subcontractor, to the Architect's satisfaction.

1.16 CORRECTION OF WORK

- A. The Electrical Subcontractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.17 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect in writing before commencement of the extra said work.

1.18 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The Electrical Subcontractor, for the work under his Contract, shall refinish and restore to the original condition all equipment which have sustained damage to the manufacturer's prime and finish coats of paint and/or enamel during the course of construction, regardless of the source of damage.

1.19 TRAINING AND OPERATION AND MAINTENANCE MANUALS

- A. The Electrical Subcontractor shall thoroughly instruct the Owner, to the complete satisfaction of the Architect and Engineer, in the proper operation of all systems and equipment provided by him. The Electrical Subcontractor shall make arrangements, via the Architect, as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all

systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Electrical Subcontractor to the Owner's representative, then the Electrical Subcontractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this specification has been complied with.

- B. Electrical Subcontractor shall submit to the Architect for approval, a minimum of two (2) typed O & M manual sets or quantity as required in Division 1 (see General Conditions and Division 1) bound neatly in 3-ring binders. Binders shall contain all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
- C. O & M manuals shall contain information indicating possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner for review prior to final submission of manuals.
- D. The O & M manuals shall contain instructions including information deemed necessary by the Architect and shall also include, but not limited to, the following:
 - 1. Introduction
 - a. Explanation of Manual and its use.
 - b. Summary description of each Electrical system.
 - c. Purpose of each system.
 - 2. System
 - a. Detailed description of each system.
 - b. Illustrations, schematics, block diagrams, catalog cuts, and other exhibits.
 - 3. Operations
 - a. Complete detailed, walk-through, with step-by-step, sequential description of all phases of operation for all portions of the systems, including start-up, shutdown, testing and adjusting. Include all posted instruction charts.
 - 4. Maintenance
 - a. Parts list and part numbers.

- b. Maintenance, and replacement charts and Electrical Subcontractor's recommendations for preventive maintenance.
- c. Troubleshooting charts for systems and components.
- d. Instructions for testing each type of part.
- e. Recommended list of on-hand spare parts.
- f. General or miscellaneous maintenance notes.
- g. Provide an estimate of manhours and material costs to perform scheduled preventative maintenance.

5. Manufacturer's Literature

- a. Complete listing for all parts with names, addresses and telephone numbers.
- b. Care and operation.
- c. FINAL APPROVED SHOP DRAWINGS FOR ALL EQUIPMENT, including all and only pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
- d. Internal wiring diagrams and engineering data sheets for all items and/or equipment to be furnished.
- e. Guarantee and warranty data.

1.20 RECORD DRAWINGS/AS-BUILT DRAWINGS

- A. The Electrical Subcontractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions and Division 01. Changes, whether resulting from formal change orders or other instructions issued by the Architect, shall be recorded. Include changes in sizes, location, and dimensions of conduit, switchgear, lighting fixtures, fire alarm equipment, wiring devices, etc.
- B. The Electrical Subcontractor shall indicate progress by coloring-in various conduits, equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.
- C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Architect and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.
- D. At the completion of the job, these prints shall be submitted to the General Contractor and then to the Architect for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected

prints, together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of As-built Record Drawings.

- E. The Subcontractor shall be responsible for generating as-built Record Drawings utilizing program approved by the owner and electronic pdf drawings. A bound set of plans, as well as the computer files, shall be turned over to the Architect for review. After acceptance of the as-built documents by the Architect, the Electrical Subcontractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) (quantity as determined by the Architect) for distribution to the Owner via the Architect.
- F. The Electrical Subcontractor may use the drawing files used for coordination drawings or request the Engineers most recently updated files. The updated drawings may not include all changes made during the course of construction and it shall be the Electrical Subcontractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc. The Electrical Subcontractor may review the Engineers latest computer files for completeness prior to purchase, however the Engineer will not be responsible for updating the computer files.
- G. Included with the above shall be a complete drawing list and an owner defined standard, which shall be required to be maintained within the as-built documents.
- H. The Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.
- I. The as-built documents required shall be in addition to other requirements stated elsewhere.

1.21 SHOP DRAWING SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements herein before specified, and with the Shop Drawings, Product Data and Samples in Division 01 in the manner described therein, modified as noted hereinafter.
- B. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.
- C. Disposition of shop drawings shall not relieve the Electrical Subcontractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Subcontractor from responsibility for errors in shop drawings or schedules.

- D. All final approved shop drawings shall be included in the required O & M manuals.
- E. Refer to each Division 26 Section for list of required shop drawing submittals.

1.22 ALTERNATES

A. General

- 1. Related requirements specified elsewhere:
 - a. Alternates: Division 01 - Section 012300.

B. Description

- 1. This section describes the changes to be made under each alternate.
- 2. Alternate proposals shall include the difference in price (addition or deduction) from the base bid, for substitution, omitting or adding to materials or construction required by the Bidding Documents as part of the base bid construction work.
- 3. The difference in price shall include all omissions, additions, adjustments of all trades as may be necessary because of each change.
- 4. Coordinate pertinent related work and modify surrounding work as required to complete the project under each alternate designated in the Owner Contractor Agreement.

PART 2 – PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 COOPERATION AND WORK PROGRESS

- A. The Electrical work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Electrical Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The Electrical Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project. Provide coordination drawings for architect/engineer to review and approve.
- B. The Electrical Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions

permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Electrical Subcontractor, shall be assumed by him without any additional cost to the Owner.

- C. The Electrical Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.
- D. The Electrical Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Electrical Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.
- E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Electrical Subcontractor shall be responsible for the security, safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.
- F. The Electrical Subcontractor shall be responsible for unloading all electrical equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the Electrical Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.
- G. It shall be the responsibility of the Electrical Subcontractor to coordinate the delivery of the electrical equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.
- H. The Electrical Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.

- I. Prior to installation, the Electrical Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of electrical equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Electrical Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect.
- J. The Electrical Subcontractor shall not allow any equipment or piping foreign to the electrical installation to be installed or pass through any room in which electrical systems or equipment are located, such as electric rooms, electric closets, telephone or data closets. The Electrical Subcontractor shall notify the General Contractor and Architect in writing of such violations and request immediate removal.
- K. The Electrical Subcontractor shall obtain from the Plumbing and HVAC Subcontractors copies of all shop drawing prints showing the ductwork and piping installation as they will be put in place on the project. These drawings shall be thoroughly checked by the Electrical Subcontractor and the routing of all conduits and installation of all outlets and electrical equipment shall be coordinated with the ductwork and piping so as to prevent any installation conflict. Such coordination shall be done prior to roughing in conduits, outlets and electrical equipment.
- L. Location of all wall outlets shall be verified with the Architect prior to roughing in conduits. Refer to details and wall elevations on the Architectural drawings. Mounting heights indicated on these drawings and/or specific dimensional information given to the Electrical Subcontractor by the Architect shall take precedence over such information indicated on the Electrical drawings.
- M. Refer to all other drawings associated with this project. Any and all equipment which require an electrical supply circuit, switch, controls or connections, whether indicated on the Electrical drawings or not, shall be furnished and installed as directed by the Architect. Locations of lighting fixtures shall conform to the Architectural reflected ceiling plans.
- N. Refer to the Architectural drawings for areas in which the concrete slab is poured on grade. In these areas a waterproofing membrane will be installed on the grade fill or earth prior to pouring of slab. Electrical conduits shall be installed to avoid the necessity of penetrating this waterproofing membrane. Penetration of the membrane, if required, shall only be made when specifically allowed by the Architect, and shall be made only at locations directed by the Architect.

3.2 INSTALLATION

A. General

1. Unless specifically noted or indicated otherwise, all equipment and material specified in Divisions 26, 27 and 28 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes or material and equipment.
2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment as to proper methods of installation.
3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
5. The Electrical Subcontractor shall coordinate the utility service installations with the local Electric Utility Co., the Owner, the Telephone Company, the City Building Department and the City Fire Department.
6. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.

3.3 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with

the Architect as to the best method of approach to minimize effects of reduced access.

- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.
- G. Refer to Division 01 Sustainable Design Requirements – LEED v4 BD+C for materials compliance requirements for low emitting VOC restrictions including paints, adhesives and sealants.

3.4 CLEANING

- A. This Section of the specifications shall include the cleaning of all equipment on a day-to-day basis and final cleaning of all electrical equipment prior to turning building over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Architect.
- B. Electrical Distribution Equipment
 - 1. All electrical distribution equipment shall be completely cleaned and dried inside and out prior to initial energizing.
 - 2. Cleaning shall consist of vacuuming all busses, windings, enclosures (inside and out), etc. After vacuuming is complete, all equipment shall be wiped down. If equipment is wet or contains moisture, it shall be thoroughly dried and inspected by the manufacturer's representative before energizing.
- C. Raceways and Junction Boxes
 - 1. All raceways and junction boxes shall be blown out and dried prior to installation of feeder conductors and branch circuit conductors.
- D. Low Tension Systems
 - 1. All cabinets and panels for low tension systems shall be thoroughly cleaned and dried prior to system start-up.
- E. Electric and Telephone Rooms
 - 1. Upon completion of cleaning electrical equipment as described in Paragraph B. above, but before energizing equipment, the entire room shall be swept clean and material storage and garbage shall be removed from the room. At this time, equipment may be energized.

2. Once equipment and room are cleaned and energized, the area shall remain clean and doors shall remain closed and locked until completion of job. Electric rooms shall not be used to store material after equipment is energized. If rooms and equipment are subject to dust and moisture after energizing equipment, the equipment shall be de-energized and re-cleaned to the same specifications.

F. Final Cleaning

1. All lighting fixtures, devices, device plates, etc., shall be cleaned and left in "like new" condition to the satisfaction of the Architect, prior to occupancy.
2. All rubbish and discarded materials shall be disposed of and removed from the site on a day-to-day basis.
3. All equipment, whether part of the Electrical Subcontractor's Contract or not, which must be cleaned due to the Electrical Subcontractor's work, shall be cleaned by the Electrical Subcontractor to the satisfaction of the Architect.

3.5 FINAL INSPECTION

- A. When all Electrical work on the project has been completed and is ready for final inspection, such an inspection shall be made. At this time, and in addition to all other requirements in the Contract Documents, the Electrical Subcontractor, for the work under this Contract, shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION

SECTION 26 05 20

BASIC MATERIALS AND METHODS

(PART OF 260000 TRADE BID)

TABLE OF CONTENTS

PART 1 – GENERAL

| | | |
|-----|--|---|
| 1.1 | RELATED DOCUMENTS | 1 |
| 1.2 | DESCRIPTION OF WORK..... | 1 |
| 1.3 | RELATED WORK | 1 |
| 1.4 | WARRANTY..... | 1 |
| 1.5 | FIRESTOPPING AND SMOKE SEALING | 1 |
| 1.6 | WATERPROOFING AND COUNTER-FLASHING | 2 |
| 1.7 | MISCELLANEOUS IRON AND STEEL..... | 2 |
| 1.8 | PHASING | 2 |
| 1.9 | SHOP DRAWING SUBMITTALS..... | 3 |

PART 2 – PRODUCTS

| | | |
|-----|-------------------------------------|---|
| 2.1 | ELECTRICAL IDENTIFICATION | 3 |
| 2.2 | HANGERS AND SUPPORTS..... | 5 |
| 2.3 | MECHANICAL SUSPENSION CHANNEL | 7 |

PART 3 - EXECUTION

| | | |
|-----|---------------------------------|---|
| 3.1 | INSTALLATION..... | 8 |
| 3.2 | MATERIALS AND WORKMANSHIP | 9 |

SECTION 26 05 20

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 01, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

- A. Refer to Section 260510 – Electrical Special Conditions.

1.3 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 260510.
- B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.4 WARRANTY

- A. Refer to provisions of the General Requirements, Supplementary General Requirements, Division 01 - Warranties and Section 260510 – Electrical Special Conditions regarding guarantees and warranties for the work under this Contract.

1.5 FIRESTOPPING AND SMOKE SEALING

- A. The Electrical Subcontractor shall provide firestopping and smoke sealing of all electrical penetrations where required by Code and as determined by the Architect.
- B. The Electrical Subcontractor shall review firestop or smoke seal systems provided under Division 07 – Fire-Stopping and provide same as specified under Division 07.
- C. Where conduits are installed through sleeves, the sleeves shall be of sufficient size to provide 1/2" annular space around the conduit passing through the sleeve and all openings shall be firestopped and sealed to limit the spread of particulate air and smoke in accordance with the requirements of an appropriate UL Listed System.

- D. Where core drilling has been provided, the core shall be of sufficient size to provide 1/2" annular space around the conduit passing through the core hole and all openings shall be firestopped and sealed to limit the spread of particulate air and smoke in accordance with the requirements of an appropriate UL Listed System.
- E. Where sleeves are installed for future cable installation, all sleeves shall be firestopped and sealed to limit the spread of particulate air and smoke in accordance with the requirements of an appropriate UL Listed System using re-enterable firestop products.
- F. All cable installations that will be subject to future moves, additions, or changes shall be firestopped and sealed to limit the spread of particulate air and smoke in accordance with the requirements of an appropriate UL Listed System using fire-rated cable pathways that permit 0 to 100 percent visual cable fill and require no further action to activate the internal sealing mechanism to provide fire and leakage ratings.

1.6 WATERPROOFING AND COUNTER-FLASHING

- A. Electrical Subcontractor shall coordinate with the General Contractor the counter-flashing of all conduit and equipment provided by him, which pierce roofs, walls and other weather-barrier surfaces. Waterproofing and counter-flashing shall be provided by the General Contractor. Refer to Division 07.
- B. Any leaks developed due to Electrical Subcontractor's work shall be repaired at the Electrical Subcontractor's expense, to Architect's satisfaction.

1.7 MISCELLANEOUS IRON AND STEEL

- A. Except where specifically indicated for the General Contractor to provide supports, Electrical Subcontractor shall provide all steel supports and hangers required to support all equipment or materials provided under this Contract.
- B. All supports shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets and framework shall be properly sized and strongly constructed.
- C. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be performed by experienced metal working mechanics. Members shall be straight and true and accurately fitted.

1.8 PHASING

- A. The Electrical Subcontractor shall construct the subject project in phases as directed by the Architect and General Contractor to suit the project progress schedule, as well as the completion date of the project.

- B. For additional information related to phasing, review the General Conditions and Supplementary Conditions under Division 01 and the Architectural drawings.

1.9 SHOP DRAWING SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Division 1 in the manner described therein, modified as noted hereinafter.
- B. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.
- C. Disposition of shop drawings shall not relieve the Electrical Subcontractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Subcontractor from responsibility for errors in shop drawings or schedules.
- D. All final approved shop drawings shall be included in the required O & M manuals.
- E. Shop drawings shall include, but shall not be limited to, the following:
 - 1. Electrical Identification
 - 2. Hangers and supports.
 - 3. Mechanical suspension channel.
 - 4. Nameplates and circuit identification.
 - 5. Wire markers, conduit markers and cable markers.
- F. UL Listing
 - 1. Furnish UL listed and labeled equipment, devices and materials. Where a UL listing is not available, submit the test reports of an independent testing engineer indicating that the equipment is in conformance with local and state codes. Tests and inspections required for approval shall be performed at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 ELECTRICAL IDENTIFICATION

- A. Nameplates
 - 1. Provide nameplates on panelboards and disconnect switches furnished or installed under Division 26. Nameplates shall designate equipment controller, function, ratings, source of power and voltage.

2. Refer to details on drawings for additional requirements and information.
 3. Nameplates shall be laminated, black bakelite with 1/4" high, white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws or rivets. Adhesives or cements shall not be used.
 4. Provide a shop drawing of nameplate schedules for approval.
- B. Panel Directories
1. Panelboards shall have typed directories, listing all circuit loads, breaker sizes and phases.
 2. Provide copy of typed directories in O & M manuals.
- C. Wire and Cable Markers
1. Feeders shall have wire markers attached indicating voltage, source, and circuit number.
 2. Branch circuits shall have wire markers attached indicating source and circuit number.
 3. Markers for wire and cable circuits shall be as manufactured by Brady, self-laminating vinyl or by Thomas & Betts E-Z-Code.
- D. Color-Code junction boxes, raceway and conductors as indicated in this specification.
- E. Provide a placard at all service entrance equipment (main switchboard(s), switchgear, fire pump, etc.) and generator identifying the location of all other service entrance equipment and generators. Provide white letters on red background. Minimum letter height 1/2".
- F. Grounding or bonding conductors installed for Telecommunications Systems shall be labeled near their termination points. Labels shall be non-metallic and include the following:
- "WARNING: If this connector or cable is loose or must be removed, please call the Building Telecommunications Manager."
- G. Labels and installation shall meet the requirements of ANSI/TIA/EIA 606 and 607.
- H. Provide wraparound labels indicating "Emergency Power" and "Voltage" on Type MI conductors (one per group) every 10' (3m) in location visible from normal

viewing angles, with the operating voltage of the circuit. This is in addition to specified color code.

- I. Provide additional warning signs, plaques, or directories as required by code, local authority or as specified or indicated on the Drawings.

2.2 HANGERS AND SUPPORTS

A. General

1. Hangers, supports, clamps, etc., shall be provided as required for all electrical equipment, including but not limited to, lighting fixtures, junction boxes, pull boxes, conduit, cable tray, busway, trapeze mounted transformers, open plenum type cabling, etc.
2. The Electrical Subcontractor shall provide all labor, materials, equipment and incidentals required for hangers and supports for all electrical equipment including concrete inserts, anchor bolts, metallic hanging and supporting devices, etc. for supporting electrical equipment.
3. Hangers and supports shall be approved standard design and shall be adequate to maintain the supported load in proper position and alignment under all operating conditions. All supports shall be designed to adequately secure the equipment against excessive dislocation due to thermal expansion and contraction and all probable external forces such as equipment, conduit and personnel contact. Installation shall meet all requirements for seismic bracing that is required by applicable Building Codes.
4. All electrical equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment supported.
5. All material used in manufacturing hangers and supports shall be capable of meeting the respective ASTM Standard Specifications with regards to tests and physical and chemical properties.
6. Hangers and supports shall be spaced in accordance with MSS SP-69 Table 3.
7. Hangers and supports shall be as manufactured the following manufactures. Product numbers used herein are based on B-Line Systems , Inc.
 - a. B-Line Systems, Inc.
 - b. Caddy/Eristrut
 - c. Unistrut
 - d. Kindorf
 - e. Superstrut

B. Hangers

1. All hangers and supports shall have some form of adjustment available after installation. Hanger material shall be compatible with the conduit material.
2. Hangers for conduit 2" and smaller shall be B-Line series B3170NF, B3174 or B3198. Hangers for conduit 2 1/2" and larger shall be B-Line series B3100, B3102 or B3170.

C. Hanger Rods

1. Hanger rods shall be B-Line series ATR (All Threaded Rod) or series B3205 with threaded at ends with allowance for adjustments. Wire and strap hangers will not be permitted. All electrical equipment shall be supported by rods, hangers, etc., using bolts.
2. Hanger rods shall be subjected to tension only. Lateral and axial movements shall be accommodated by proper linkage in the rod assembly.
3. Hanger rod diameters shall be based on MSS SP-69 Table 4.

D. Beam Clamps

1. All beam clamps shall be concentric loaded type clamps which engage both edges of the beam flange. The hanger shall be located directly below the web of the beam. Consult with Structural Engineer to ascertain maximum loading on hanger in each area.
2. Beam clamps shall be B-Line series B3054, B3055 or B3291 through B3297.

E. Concrete Inserts

1. Concrete inserts for hangers shall be continuous metal or spot inserts designed to be used in ceilings, walls or floors and shall be as follows:
 - a. Continuous concrete inserts shall be used where applicable for hanger rod sizes up to 3/4" diameter. Inserts may be used where supports are parallel to the main slab reinforcement and shall be B-Line series B22I, B32I or B52I.
 - b. Spot concrete inserts shall be used where applicable for hanger rod sizes up to and including 7/8" diameter. Inserts shall be B-Line series B2505 through B2508, B2500, B2501 or B3014.

F. Welded Steel Brackets

1. Wall or column supported conduits shall be supported by welded steel brackets B-Line series B3064 or B3066.

G. Stanchions

1. For floor supported equipment, such as safety switches in mechanical areas, provide either cast-in-place concrete supports or field installed supports. Each support shall be screwed or welded to the corresponding size base stand. Supporting pipe shall be of schedule 40 steel pipe construction. Each base stand shall be secured to the concrete floor by expansion bolts. Base stands shall be B-Line series B3088 or B3088T.

H. Riser Conduits

1. Riser conduits shall be supported independently from of any horizontal conduits.
2. Support all vertical runs of conduits at each floor with B-Line series B3373 or B3373CT as required.

I. Strut Channel

1. Strut channel trapeze hangers shall be used to support parallel conduit runs. Conduit racks or stanchions fabricated with strut channel shall be used in areas with multiple conduit runs. Strut clamps and straps shall be used to maintain proper alignment. Strut shall be a minimum of 1 5/8" wide, B-Line series B22 or heavier as required. Clamps and straps shall be B-Line series B2000 suitable for the conduit material (EMT, IMC or RGS).
2. Provide strut channel above ceilings for support of electrical equipment such as lighting fixtures where mechanical equipment and ductwork interfere with direct mounting methods. Strut shall be used to span the width of the interference and supported by rods on each end.
3. Provide all required appurtenances required to properly hang and assemble strut supports.

2.3 MECHANICAL SUSPENSION CHANNEL

- A. Mechanical suspension channel shall be furnished and installed to support electrical equipment, (panelboards, disconnect switches, starters, transfer switches, transformers, etc.) independent of walls. Where walls back up to occupied spaces, the suspension channels shall be at least 1/2" clear of the wall and shall not be directly attached to the wall.

- B. Channel shall be Unistrut, Type P3000 or approved equal. All fasteners and fittings shall be supplied to provide a complete installation as required. Channel shall be sized and mounted to allow for future conduits.
- C. All channel and fittings shall be furnished with the manufacturer's standard hot dipped galvanized finish.
- D. Channel shall be manufactured by one of the following: Unistrut Products Co., Kindorf, or B-Line.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General
 - 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes or material and equipment.
 - 2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment provided under Part 2 of this specification as to proper methods of installation.
 - 3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
 - 4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
 - 5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a hot-dipped galvanized finish.
- B. Hangers, Supports and Mechanical Suspension Channel
 - 1. All horizontal runs of conduits shall be properly grouped, aligned, using substantial hangers, straps, etc. Hangers and supports shall be installed at intervals not exceeding Code requirements.

2. Structural Support Interface

- a. All conduit, raceways, electrical equipment and other similar system components which are supported by roof or floor joists shall be hung from the top chord or bottom chord panel point or a panel point shall be provided by applying a vertical web member. The maximum load shall not exceed 250 pounds.
- b. All conduit, raceways, electrical equipment, etc., which are supported by roof/floor beams shall be hung from the beams with clamp attachments which engage both edges of the beam flange. The hanger shall be located directly below the web of the beam and the hanger load shall be limited to 1000 pounds in area above mechanical room and 250 pounds in remaining areas, unless otherwise approved by the Architect.
- c. All additional supports, clamps, web members, etc., required to comply with the above requirements shall be provided by the Electrical Subcontractor, as applicable, for the work furnished and installed under this Contract.

3.2 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

Renovation and Repair of the
George A Ayotte and Joseph M. Downes Parking Facilities
Lowell, MA
Gale JN 837920
100% Design Submission

END OF SECTION

SECTION 26 05 30

WIRING METHODS

(PART OF 260000 TRADE BID)

TABLE OF CONTENTS

PART 1 - GENERAL

| | | |
|-----|------------------------------|---|
| 1.1 | RELATED DOCUMENTS | 1 |
| 1.2 | DESCRIPTION OF WORK..... | 1 |
| 1.3 | RELATED WORK | 1 |
| 1.4 | WARRANTY..... | 1 |
| 1.5 | EQUIPMENT CONNECTIONS..... | 1 |
| 1.6 | SHOP DRAWING SUBMITTALS..... | 1 |

PART 2 – PRODUCTS

| | | |
|-----|--------------------------------------|---|
| 2.1 | WIREWAYS | 2 |
| 2.2 | BOXES..... | 2 |
| 2.3 | CONDUCTORS - 600 VOLTS | 3 |
| 2.4 | METALLIC CONDUIT..... | 6 |
| 2.5 | SOLDERLESS LUGS AND CONNECTORS | 7 |

PART 3 – EXECUTION

| | | |
|-----|---------------------------------|----|
| 3.1 | INSTALLATION..... | 7 |
| 3.2 | MATERIALS AND WORKMANSHIP | 14 |
| 3.3 | EQUIPMENT CONNECTIONS | 15 |

SECTION 26 05 30

WIRING METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 01, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

- A. Refer to Section 260510 – Electrical Special Conditions.

1.3 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 260510.
- B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.4 WARRANTY

- A. Attention is directed to provisions of the General Requirements, Supplementary General Requirements, Division 01 - Warranties and Section 260510 – Electrical Special Conditions regarding guarantees and warranties for the work under this Contract.

1.5 EQUIPMENT CONNECTIONS

- A. The Electrical Subcontractor shall be responsible to provide all conduit and wiring connections to equipment provided under other Sections of the specifications and provided by the Owner.
- B. Coordinate location of all equipment with the General Contractor. Obtain installation diagrams and methods of installation of all equipment from equipment manufacturers.

1.6 SHOP DRAWING SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Division 01 in the manner described therein, modified as noted hereinafter.

WIRING METHODS

- B. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.
- C. Disposition of shop drawings shall not relieve the Electrical Subcontractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Subcontractor from responsibility for errors in shop drawings or schedules.
- D. All final approved shop drawings shall be included in the required O & M manuals.
- E. Shop drawings shall include, but shall not be limited to, the following:
 - 1. Wireways.
 - 2. Boxes.
 - 3. Conductors - 600 volts.
 - 4. Conduit.
 - 5. Surface mounted raceway system.
 - 6. Contractor proposed routing of all conduits 2 inches in diameter and larger.

PART 2 - PRODUCTS

2.1 WIREWAYS

- A. Furnish and install hot dipped galvanized wireways as required and/or as indicated on the drawings.
- B. Wireways shall be sized as required or minimum 6" x 6" x length as required. Wireways shall be provided with hinged covers. Install with hinges on the front face bottom of the wireway.
- C. Wireways shall be as manufactured by Cutler Hammer, General Electric, Square D, Siemens, Hoffman or Approved Equal.

2.2 BOXES

- A. Junction and Pull Boxes
 - 1. Boxes shall be constructed of code-gauge galvanized steel or metal with baked enamel and shall be installed at points as required whether indicated on the drawings or not. Minimum dimension shall not be less than NEC requirements.

2. Provide flat plain removable covers with suitable flat head machine screws or slotted truss head bolts.
3. Boxes shall be constructed with suitable barriers separating different systems where required.
4. Boxes exceeding 4'-0" in any direction shall be reinforced with angle iron stiffeners and shall contain cable supports.
5. Boxes shall be manufactured by one of the following: Hoffman, McKinstry or Approved Equal.
6. Boxes for exterior work in wet and damp locations, exposed interior locations shall be hot dipped galvanized.

B. Outlet Boxes (Backboxes)

1. Outlet boxes shall be one-piece code-gauge galvanized steel construction meeting NEC requirements, of proper size and suitable for location indicated on the drawings.
2. Boxes for surface mounted devices shall be a finished type (surface box).
3. Boxes for exterior work, in wet locations, exposed interior locations and in mechanical rooms shall be cast type FS or FD Series, with cadmium plated covers. Steel boxes will not be permitted.

2.3 CONDUCTORS - 600 VOLTS

A. General

1. Feeders
 - a. All feeder wiring shall be manufactured of copper, rated at 600 volts, single conductor. Conductors #8 AWG and larger shall be stranded.
 - b. Feeder wiring may be allowed to be aluminum where allowed by the Owner.
 - 1) XHHW-2: Type XHHW-2 conductors shall be Listed by Underwriters Laboratories (UL Standard 44) and suitable for operation at 600 volts or less at a maximum operating temperature of 90°C maximum in wet or dry locations. Conductors shall be marked "SUN-RES". Aluminum alloy conductors shall be compact stranded conductors of AlumaFlex TM (AA-88176) as manufactured by Southwire or STABILOY® (AA-8030) as manufactured by Alcan

Cable or approved Listed equal. AA-8000 Series
aluminum alloy conductor material shall be recognized by
The Aluminum Association.

2. Branch Circuits

- a. All branch circuit, remote control, signal circuit and interlock wiring shall be manufactured of copper, rated at 600 volts, single conductor. Conductors #8 AWG and larger shall be stranded. All wiring #10 AWG and smaller shall be solid.
- b. Minimum size wire for branch circuit and power wiring shall be #12 AWG.
 - 1) Refer to Part 3 for voltage drop considerations.
- c. All wiring shall be installed in conduit (power, low voltage and control wiring), unless specifically indicated otherwise.
- d. Conductors #10 and #12 AWG shall be connected with pre-insulated spring connectors encased in a steel shell (wire nuts) and rated at not less than 105°C. A minimum of 3/8" skirt shall cover the bare wires. The connector shall meet with UL approval for fixture and pressure work and shall be "B-Cap" Type B1, B2 and B4 electrical spring connectors as manufactured by the Buchanan Co., Ideal or approved equal. Pushwire connectors (as similar to WAGO Wall-Nuts) shall NOT be allowed, only wire nuts shall be allowed for connections.

B. References

- 1. All wiring shall conform to the National Electrical Code for construction and use.
- 2. Conductor type THHW shall meet or exceed the following:
 - a. ASTM B-3 or B-8
 - b. UL Standard 83
 - c. UL listed as type THHW
- 3. Conductor types THWN shall meet or exceed the following:
 - a. ASTM B-3 or B-8
 - b. UL Standard 83
 - c. UL listed as type THWN
- 4. Conductor type XHHW shall meet or exceed the following:

- a. ASTM B-3 or B-8
- b. ICEA S-95-658
- c. NEMA WC-70
- d. UL Standard 44
- e. UL listed as type XHHW

5. Conductor type XHHW-2 shall meet or exceed the following:

- a. ASTM B-3 or B-8
- b. ICEA S-95-658
- c. NEMA WC-70
- d. UL Standard 44
- e. UL listed as type XHHW-2

C. Insulation

1. Insulation types for all conductors shall be as follows:

| Description | Location | | |
|--|-----------|--------|--------|
| | Dry | Damp | Wet |
| Copper Branch Circuits #6 AWG and smaller | THHN/THWN | THWN | THWN |
| Copper Branch Circuits larger than #6 AWG | XHHW | XHHW | XHHW-2 |
| Copper Feeders not listed below | XHHW | XHHW | XHHW-2 |
| All Aluminum Feeders | XHHW-2 | XHHW-2 | XHHW-2 |
| All Service Feeders, Exterior Feeders and Exterior Branch Circuits | XHHW-2 | XHHW-2 | XHHW-2 |
| All Feeders connected to 100% rated circuit breakers | XHHW-2 | XHHW-2 | XHHW-2 |

D. Color Coding

1. Color coding shall match the Owners color coding standard. If no standard color coding system exists, use the following:

| 208/120 Volts | | | 480/277 Volts | | |
|---------------|---|-------|---------------|---|--------------------------|
| A Phase | - | Black | A Phase | - | Brown |
| B Phase | - | Red | B Phase | - | Orange |
| C Phase | - | Blue | C Phase | - | Yellow |
| Neutral | - | White | Neutral | - | Grey |
| Ground | - | Green | Ground | - | Green with Yellow Stripe |

2. Color coding shall be continuous on insulation for #6 AWG or smaller and continuous or marked with color tape at all connections and in all pull,

junction and outlet boxes for conductors larger than #6 AWG.

E. Manufacturers

1. Branch circuit and feeder conductors shall be manufactured by one of the following: General Cable, Southwire, Okonite or Approved Equal.

2.4 METALLIC CONDUIT

A. General

1. Raceways installed in the exterior and in the garage regardless of wet or damp locations, shall be Rigid Metal Conduit (RMC).
2. Raceways for feeders and branch circuits shall be rigid metal conduit (Type RMC), intermediate metal conduit (Type IMC) or electrical metallic tubing (Type EMT) subject to the restrictions of the National Electrical Code. The minimum size allowed shall be 3/4".
3. Refer to Part 3 of this specification for installation requirements.

B. Rigid Metal Conduit (RMC)

1. RMC shall be dip galvanized and it shall be permitted under all conditions subject to the restrictions of the National Electrical Code and Part 3 of this specification. Regardless of drawings or other sections in these specifications, in wet locations or locations open to exterior weather (wet or damp), Rigid Metal Conduit shall be provided.
2. Conforms to:
 - a. UL 6
 - b. Federal Specification WW-C-581
 - c. ANSI C80.1
3. Connectors and Couplings shall be threaded.

C. Electrical Metallic Tubing (EMT)

1. EMT shall be permitted in dry locations only where raceways are installed in the electric room. Subject to the restrictions of the National Electrical Code and Part 3 of this specification, except as noted below.
2. EMT shall NOT be permitted:
 - a. For electric service feeders
 - b. To be direct buried underground.
 - c. For exterior runs.
 - d. In concrete, mortar, grout, or other cementitious materials.

- e. In floor slabs.
 - f. Where subject to extreme physical damage.
 - g. In corrosive areas.
 - h. In wet locations
- 3. Conforms to:
 - a. UL 797
 - b. Federal Specification WW-C-563
 - c. ANSI C80.3
- 4. Connectors and Couplings
 - a. Connectors and Couplings shall be steel.
 - b. Connectors and Couplings shall be set screw type.
- D. Liquidtight Flexible Metal Conduit (Type LFMC) shall be used for connection to all electric vehicle charging stations (EVSE). Separate ground conductor shall be installed for all liquidtight flexible conduit sizes. Liquidtight flexible metal shall be manufactured by Electri-Flex, AFC, Anamet, or Approved Equal.
- E. Conduit bodies and fittings shall be complete with gaskets and covers where required.
- F. Expansion fittings shall be provided where conduit passes through building expansion joints, and shall be of the weatherproof telescopic type. The expansion fitting shall permit a minimum movement of 4".
- G. Conduit and tubing shall be manufactured by one of the following: Wheatland, Allied Tube & Conduit Co., or Approved Equal.

2.5 SOLDERLESS LUGS AND CONNECTORS

- A. All lugs for 600 volt feeder conductors and connectors for branch circuit joints shall be of the solderless type suitable for copper and aluminum wire.
- B. Lugs and wire connectors shall be one of the following: IlSCO, Anderson, Burndy Corp., Thomas & Betts Co or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General
 - 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and

requirements peculiar to certain items and classes or material and equipment.

2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment provided under Part 2 of this specification as to proper methods of installation.
3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.

B. Core Drilling

1. Electrical subcontractor shall provide core drilling required for installation of electrical systems as follows:
 - a. Electrical subcontractor shall carry all costs for core drilling, including but not limited to, drilling of openings, time and materials to safely seal and fireproof/waterproof/smokeproof all openings, protection of structure and area of drilling, clean-up of area, etc.
 - b. Electrical subcontractor shall be responsible for any circular penetrations required for proper installation of electrical systems.
 - c. Locate required openings, prior to coring, and coordinate openings with existing utilities, trades, etc.
 - d. Do not disturb or interrupt existing systems.
 - e. Electrical subcontractor shall be responsible for damage to building and building systems from coring operation.
 - f. All holes, openings, etc. shall be sealed to the satisfaction of the Engineer, Architect and Owner.

C. Conduits

1. Conduit shall be run concealed in finished areas above suspended

ceilings, in wall spaces, etc. Exposed conduit runs in finished areas require Architect's approval. All conduit runs shall be properly grouped and installed parallel to walls, ceilings, etc., and supported with proper hangers, clamps, etc.

2. Conduit bends shall be made with conduit bending machines or by an approved hickey. Lock nuts and insulated throat bushings of the compatible material shall be used to fasten conduit to outlet boxes, cabinets, etc.
3. Conduit ends shall be cut square, threaded and reamed to remove burrs and sharp edges. Field threads shall be of the same type and have the same effective length as factory cut threads. Excessive exposed threads will not be allowed. Turns, wherever required in exposed conduit runs, shall be made by the use of factory-made bends, or field-made bends as approved. In condulets, or in the event of a multiplicity of conduits making the same turn, a steel junction box with a removable steel cover may be used. Offsets and bends for changes in elevation of exposed conduit runs shall be made at walls or beams and not in open spaces between walls or beams. Conduits shall be routed so as not to interfere with the operation or maintenance of any equipment. The entire job shall be done in a neat and workmanlike manner, as approved by the Architect. Steel supports or racks shall be galvanized steel channel and fittings.
4. All conduit work shall be carefully cleaned and dried inside before the installation of conductors. Wire shall not be pulled into conduit system until building roof and walls are weather-tight. Plug conduit ends to exclude dust, moisture, plaster or mortar while building is under construction. No lubricants or cleaning agents which might have a deleterious effect on conductor coverings shall be used for drawing conductors into raceways.
5. Drawings, in relation to routing of conduits, are diagrammatic. Except where additional conduits may be required to avoid de-rating of branch circuits, as required elsewhere within this Section, the number and size of conduits and wire shall be furnished and installed as indicated by the drawings. Conduits shall be routed in the field so as to be coordinated with the building structure. Permanently concealed conduit shall be as short and direct as possible. Exposed conduit and conduit concealed by removable finishes such as accessible ceiling tile shall be run in straight lines parallel and perpendicular to walls, beams and columns and with right angle bends.
6. Conduits passing through floors, walls and beams shall be of such size, number and in such locations so as not to impair the strength of the construction.
7. Raceways in ceiling spaces shall be routed in such an approved manner

as to eliminate or minimize the number of junction boxes required, but also shall be routed in an orderly and organized manner. Support rods and clamps shall be furnished and installed as required. Support of conduits by use of wire is strictly prohibited. Conduits shall be supported and secured by listed conduit support devices as required. Routing and installation of conduits shall be strictly coordinated with the General Contractor, other Trades and the Architect.

8. Where rigid metal conduit is threaded in the field, a standard conduit cutting die providing 3/4" taper per foot shall be employed. Threadless coupling shall not be used on rigid metal conduit except where specifically allowed by the Architect. Running threads shall not be used on rigid metal conduit. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit.
9. Conduit work shall be installed in such a manner to keep exposed threads to an absolute minimum, and in no case shall more than (3) threads be left exposed after the conduit work is made up tight.
10. Check raceway sizes to determine that green equipment ground conductor fits in same raceway with phase and neutral conductors to meet NEC percentage of fill requirements. Increase duct, conduit, tubing and raceway sizes shown or specified as required to accommodate conductors.
11. Conduit secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.
12. Threaded sealing fittings for rigid steel conduits shall be cadmium-coated, malleable iron. Sealing fittings for aluminum conduit shall be threaded cast aluminum. Fittings that prevent passage of water vapor shall be continuous drain. Install and seal fittings as required by manufacturer's recommendations.
 - a. Install sealing fittings at following points, and elsewhere as shown:
 - 1) Where conduits pass from warm to cold locations.
 - 2) Where required by NEC.
 - b. Secure conduit system as required by NEC.

D. Pull, Junction and Outlet Boxes

1. The Electrical Subcontractor shall furnish and install pull boxes for all

feeders as required by NEC. Pull boxes shall be code gauge steel plates fastened to angle iron frames with removable covers. Covers shall be secured with brass machine screws.

2. The Electrical Subcontractor shall furnish and install junction boxes for feeders and branch circuits as required. Boxes shall be sized in accordance with NEC. Junction boxes shall be code gauge steel with removable covers. Covers shall be secured with brass machine screws.
3. All boxes shall be rigidly mounted to construction and shall be equipped with suitable screw fastened covers. Unused open knockouts in all boxes shall be plugged with suitable blanking devices. All boxes installed that do not have equipment mounted on them shall be provided with blank covers.

E. Cutting, Patching and Conduit Sleeves

1. The Electrical Subcontractor shall be responsible for all core drilling required for his work, but in no case shall he cut into any structural elements without the written approval of the Architect.
2. All cutting, rough patching and finish patching required for electrical work shall be provided by the Electrical Subcontractor.
3. Where conduits pass through masonry or concrete walls, foundations or floors, the Electrical Subcontractor shall set such sleeves as are necessary for passage of the conduits. Sleeves shall be of sufficient size to provide air space around the conduit passing through for fireproofing. The Electrical Subcontractor shall be responsible for the exact location of sleeves provided under his Contract.
4. Conduit passing through exterior walls and floors below grade shall be made watertight with caulking compound and pipe sleeves with wall collar located at the center of the wall extending 8" all around the conduit. Collar shall be 1/8" thick steel welded to sleeve. Coordinate material requirements with the Contractor.
5. Sleeves and inserts shall not be used in any portions of the building where their use would impair strength or construction features of the building. Elimination of sleeves must be approved by Architect.
6. Conduits passing through fire partitions shall be provided with 10 gauge steel pipe sleeves and firestopped.
7. Where conduits passing through openings are exposed in finished rooms, finishes of filling materials shall match and be flush with adjoining floor, ceiling and wall finishes.

8. Fill slots, sleeves and other openings in floors and walls if opening is not used. Identify unused sleeves and slots for future installation.
9. Lay out conduit and openings in advance, to permit provision in work. Set sleeves and conduit in forms before concrete is poured. Provide remedial work where sleeves and conduits are omitted or improperly placed.

F. Feeder and Branch Circuit Conductors (600 Volts)

1. Install wire and cable in approved raceways as specified and as approved by Authorities that have jurisdiction. Surface metal raceways shall not be used unless explicitly specified and shown on the drawings. Do not use surface raceways on floor.
2. The branch circuit wiring has been designed for dedicated neutral conductors for each circuit and shall be installed as indicated on the drawings. All home runs shall have dedicated neutrals, sharing of neutrals shall NOT be allowed. No more than (3) 1-pole branch circuits (or 6 current carrying conductors) shall be installed in any conduit run.
3. Follow homerun circuit numbers shown on the drawings to connect circuits to panelboards. Where homerun circuit numbers are not shown on the drawings, divide similar types of connected loads among phase busses so that currents in each phase are within 10% of each other during normal usage.
4. All feeder, branch circuit or auxiliary system wiring passing through pull boxes and/or being made up in panelboards shall be properly grouped, bound and tied together in a neat and orderly manner in keeping with the highest standards of the Trade, with plastic cable ties. Loose ends of the cable ties shall be properly trimmed after making up same. Cable ties shall be Ty-Raps, as manufactured by Thomas & Betts, Holub Industries, Inc., Quick-Wrap, Burndy Unirap or approved equal.
5. Branch circuits and auxiliary system wiring shall be peeled out of the wiring gutters at the terminal cabinet and panels at 90° to circuit breakers and terminal lugs for connecting to same.
6. For large size conductors available only in black, use colored plastic tape at all ends, where connections and splices are made and in all pull boxes for the specified color code identification. Tape shall be wrapped around the conductor (3) complete turns.
7. Joints and splices shall be made in an approved manner and shall be equivalent, electrically and mechanically, to the conductor insulation. All conductors shall be connected by use of solderless crimp (compression) type connectors; these joints and splices shall be taped with (1) wrap of varnish cambric tape and then a minimum of (3) wraps of No. 88

Scotchbrand (3M Company) all-weather vinyl plastic electrical tape, or equal Permacel or Plymouth Co. Each wrap of tape shall be half-lapped. Conductors of size #4 AWG or larger shall have (2) coats of insulating varnish applied over the tape for joints in manholes, handholes or exposed-to-weather conditions.

8. The number and size of conductors in each run of conduit is indicated on the drawings. Where there is a conflict between the number of wires indicated and the actual number required, the actual number and size required shall be installed.
9. All branch circuits shall be connected to breakers at Electrical Subcontractor's discretion. The balancing of all loads between phases shall be the Electrical Subcontractor's responsibility.
10. Splices, taps and lugs shall be electrically and mechanically secure and solderless lugs, and crimp connectors shall be used. Lugs shall be used for conductor sizes #8 AWG and larger. All lugs shall be of the proper size, and in no case shall strands be cut from a conductor in order to fit the conductor into a lug. Provide lug/cable adapters for breakers where oversized cables are indicated. All lug connections to buses in switchboards, unit substations, motor control centers, etc., shall be 2-bolt/nut connections.
11. Provide 1/4" polyethylene ropes for pulling wire. Provide wire pulling lubricants that meet applicable UL requirements as necessary.
12. Provide cable supports for vertical feeders as required by NEC. Vertical feeders shall be supported at every other floor level.
13. Provide split wedge cable supports with clamps for cable without metallic sheath in pull boxes. Supports shall be as manufactured by O.Z./Gedney or approved equal.
14. All wiring shall be installed and supported in accordance with the requirements of the NEC.
15. Branch circuits conductors shall be sized and installed for a maximum voltage drop of 3% per the following tables:

| 120 volt Branch Circuit Voltage Drop Table | |
|---|--------------------|
| Circuit Length | 120 volt Wire Size |
| 0'-60' | #12 |
| 61'-100' | #10 |
| 101'-160' | #8 |
| Table is based on a 120 circuit load of 1680 watts (14 amps) | |

| 277 volt Branch Circuit Voltage Drop Table | |
|---|--------------------|
| Circuit Length | 120 volt Wire Size |
| 0'-140' | #12 |
| 141'-225' | #10 |
| 226'-350' | #8 |
| Table is based on a 120 circuit load of 3880 watts (14 amps) | |

- 1) Optional voltage drop compliance: If the actual load on the branch circuit is less than 1680 watts for the 120 volt circuit and less than 3880 watts for the 277 volt circuit, the Electrical Subcontractor shall be allowed to increase the circuit lengths listed in the above tables. However, the Electrical Subcontractor shall submit voltage drop calculations indicating circuit loads and increased lengths for approval by the Engineer PRIOR to installing the wiring.
- 2) Contractor shall be aware of voltage drop for 3-way and 4-way lighting switching circuits and shall increase the size of the switch-legs/conductors as required.

3.2 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.3 EQUIPMENT CONNECTIONS

- A. Furnish and install all power wiring and conduit including connections as required for equipment.
- B. Liquidtight Flexible Metal Conduit (Type LFMC) shall be used for connection to electric vehicle charging stations (EVSE). Separate ground conductor shall be installed for all liquidtight flexible conduit sizes.
- C. Make all final connections to equipment..
- D. Equipment grounding integrity of all equipment and non-current-carrying metal parts must be ensured.
- E. All equipment requiring electrical connections which is furnished under other Sections and by others shall be connected under this Section.
- F. Before connecting any piece of equipment, check the nameplate rating against the information shown on the drawings and call to the attention of the Architect any discrepancies.
- G. The Electrical Subcontractor shall carefully study all equipment manufacturer's wiring diagrams and make corrections accordingly.
- H. The Electrical Subcontractor shall be held responsible for any damage done to motors or equipment driven by motors, due to incorrect direction of rotation, caused by faulty electrical connections, and incorrectly sized motor circuit protection, furnished under this Contract.

END OF SECTION

SECTION 26 20 10

LOW VOLTAGE DISTRIBUTION

(PART OF 260000 TRADE BID)

PART 1 – GENERAL

| | | |
|------|---|---|
| 1.1 | RELATED DOCUMENTS | 1 |
| 1.2 | DESCRIPTION OF WORK..... | 1 |
| 1.3 | RELATED WORK | 1 |
| 1.4 | QUALITY ASSURANCE | 1 |
| 1.5 | WARRANTY..... | 1 |
| 1.6 | QUALIFICATIONS | 1 |
| 1.7 | DELIVERY, STORAGE AND HANDLING..... | 2 |
| 1.8 | ACCEPTABLE MANUFACTURERS..... | 3 |
| 1.9 | SHOP DRAWING SUBMITTALS..... | 3 |
| 1.10 | CLOSEOUT SUBMITTALS AND O & M MANUALS | 4 |

PART 2 – PRODUCTS

| | | |
|-----|--|----|
| 2.1 | FUSES | 4 |
| 2.2 | PANELBOARDS - BRANCH CIRCUIT AND DISTRIBUTION..... | 5 |
| 2.3 | SAFETY SWITCHES | 9 |
| 2.4 | TRANSFORMERS - DRY TYPE DISTRIBUTION..... | 10 |

PART 3 – EXECUTION

| | | |
|-----|---------------------------------|----|
| 3.1 | INSTALLATION..... | 13 |
| 3.2 | MATERIALS AND WORKMANSHIP | 15 |
| 3.3 | FIELD QUALITY CONTROL | 16 |
| 3.4 | TRAINING | 16 |

SECTION 26 20 10

LOW VOLTAGE DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 01, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

- A. Refer to Section 260510 – Electrical Special Conditions.

1.3 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 260510.
- B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.4 QUALITY ASSURANCE

- A. The manufacturers listed within this specification have been pre-selected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. To ensure system compatibility, all low voltage distribution equipment shall be the products of one manufacturer.

1.5 WARRANTY

- A. Attention is directed to provisions of the General Requirements, Supplementary General Requirements, Division 01 - Warranties and Section 260510 – Electrical Special Conditions regarding guarantees and warranties for the work under this Contract.

1.6 QUALIFICATIONS

- A. The manufacturer of the low voltage distribution equipment shall be the manufacturer of the major components within the equipment.

- B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The low voltage distribution equipment shall be suitable for and certified to meet all applicable seismic requirements of the latest accepted edition of the Massachusetts State Building Code for seismic zone 2 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, with a peak acceleration and ZPA as required per the Code. The tests shall fully envelope the response spectrum for all equipment natural frequencies up to at least 35 Hz.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Electrical Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- B. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces. Equipment such as switchgear with heater elements installed shall have the heater elements energized after the equipment is received by the Electrical Subcontractor.
- C. The Electrical Subcontractor shall be responsible to fully inspect all shipments for damage and report damage to the manufacturer and the Architect.
- D. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the Electrical Subcontractor's expense.
- E. The Electrical Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of

equipment to allow for the final installation to conform to the drawings and specifications.

- F. The low voltage distribution equipment shall be split into shipping groups for handling as directed by the Electrical Subcontractor or as the manufacturer's limitations dictate. Shipping groups shall be designed to be shipped by truck, rail or ship. Shipping groups shall be bolted to skids. Accessories shall be packaged and shipped separately. Each switchgear shipping group shall be equipped with lifting eyes for handling solely by crane.
- G. The low voltage distribution equipment being stored prior to installation shall be stored so as to maintain the equipment in a clean and dry condition. If stored outdoors, indoor gear shall be covered and heated, and outdoor gear shall be heated.

1.8 ACCEPTABLE MANUFACTURERS

- A. Eaton – Cutler-Hammer
- B. ABB/General Electric
- C. Siemens
- D. Schneider Electric – Square D

1.9 SHOP DRAWING SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Division 01 in the manner described therein, modified as noted hereinafter.
- B. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.
- C. Disposition of shop drawings shall not relieve the Electrical Subcontractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Subcontractor from responsibility for errors in shop drawings or schedules.
- D. Include short circuit, coordination and arc flash studies when specified here in this specification. Regardless of this specification where the highest continues current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1200 Ampere or higher, the contractor shall meet the NEC requirement by providing short circuit, coordination and arc flash studies and making the documentation available to those who are authorized to design, install, operate, or inspect the installation as to the location of such circuit breakers. The contractor shall be responsible to coordinate with the equipment manufacturer and include an Arc Energy reduction method such

as Energy-reducing maintenance switching with local status indicator to meet the code.

- E. All final approved shop drawings shall be included in the required O & M manuals.
- F. Shop drawings shall include, but shall not be limited to, the following:
 - 1. Panelboards - branch circuit and distribution. (100A-1200A)
 - 2. Safety switches.
 - 3. Transformers - dry type.

1.10 CLOSEOUT SUBMITTALS AND O & M MANUALS

- A. The following information shall be submitted for record purposes, in a binder, prior to final payment:
 - 1. Final as-built drawings and information for items listed above.
 - 2. Operation and maintenance manuals with the following information:
 - a. Instruction books and/or instruction leaflets
 - b. Recommended renewal parts
 - 3. Wiring diagrams.
 - 4. Certified production test reports.
 - 5. Installation information.

PART 2 - PRODUCTS

2.1 FUSES

- A. All fuses shall be rated for proper voltage in which they are applied. Interrupting ratings shall be greater than the short circuit current available at the terminals of the switch.
- B. Fuse Types
 - 1. Fuses for motor branch circuits shall be dual element time delay Type RK5.
 - 2. Fuses for equipment other than motor loads shall be general purpose 1-time Class K1.

3. Control power transformers for motor controller circuits shall be as recommended by motor starter and motor control center manufacturer.
4. Fuses for elevator lifts shall be dual element type and sized in accordance with elevator manufacturers recommendations.

C. Spare Fuses

1. Provide spare fuses in the amount of 20% (not less than three (3) nor more than nine (9) of all sizes and types).
2. Spare fuses shall include general purpose fuses, motor fuses, and control fuses used in motor control centers, starters, etc.
3. A complete list and quantity of spare fuses shall be submitted with record drawings for review.

D. Manufacturers

1. Gould Shawmut
2. Bussman
3. Eaton
4. Cooper
5. GE

2.2 PANELBOARDS - BRANCH CIRCUIT AND DISTRIBUTION

1. All panelboards shall be UL listed and labeled. Panelboards shall have rating not less than the short circuit ratings available from the power sources.

B. Construction

1. Interiors shall be completely factory assembled with bolt-on devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
2. All spaces indicated in distribution panels shall be provide with connector kits to allow installation of future circuit breakers. Where no spaces are indicated on the drawings, provided spaces for remaining poles.
3. Trims for distribution, lighting and appliance panelboards shall be supplied with a door-in-door trim. The inner door shall be a hinged door over all circuit breaker handles. The outer door shall be the entire trim with a piano hinge to expose wiring gutters. Inner door in panelboard trim shall not uncover any live parts. Inner doors shall have a semiflush cylinder lock and catch assembly. Doors over 48 inches in height shall

have auxiliary fasteners. Switching device handles in distribution panelboards shall be accessible.

4. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
5. Where double tub panels are indicated on the drawings, each tub shall contain the same number of breakers and spaces. Box and trim sizes shall be identical.
6. Where auxiliary gutters are indicated for feed through lugs, a separate gutter shall be attached to the panelboard, sized as required based on conductor size, with an individual cover.
7. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
8. All locks shall be keyed alike.

C. Bus

1. Main bus bars shall be copper or plated aluminum sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
2. A bolted ground bus shall be included in all panels.
3. In addition to the bolted ground bus, an isolated ground bus shall be included in panels as indicated on the drawings.
4. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.
5. Neutral Bus
 - a. Full-size insulated neutral bars shall be included for panelboards shown with neutral.
 - b. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

D. Power Distribution Panelboards, Circuit Breaker Type

1. Molded case circuit breakers shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics.

2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy, and arc extinction shall be accomplished by means of DE-ION arc chutes.
3. Circuit breakers 250 ampere frame and below shall be of the thermal-magnetic type with inverse time-current characteristics or shall be of the solid state type.
4. Circuit breakers over 250 ampere frame shall be microprocessor-based with true RMS sensing trip units.
 - a. Each molded case circuit breaker microprocessor-based tripping system shall consist of three current sensors, a microprocessor, and a flux-transfer shunt trip. True RMS sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached.
 - b. Interchangeable rating plugs shall establish the continuous trip ratings of each circuit breaker. Rating plugs shall be interlocked so they are not interchangeable between frames, and interlocked such that a breaker cannot be closed and latched with the rating plug removed.
 - c. The microprocessor-based trip system shall have thermal memory capabilities to prevent the breaker from being reset following an overload condition until after a preset time delay.
 - d. Molded Case Circuit Breaker Trip Units
 - 1) System coordination shall be provided by the following microprocessor-based time-current curve shaping adjustments:
 - a) Adjustable long time pick-up and delay
 - b) Adjustable short time pick-up and delay, with selective curve shaping
 - c) Adjustable instantaneous pick-up

E. Branch Circuit Panelboards

1. Bolt-in type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.
2. Circuit breakers shall be thermal magnetic type with common type handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100 ampere frame and through 100 ampere trip sizes shall take up the same pole spacing. 20 ampere, single pole circuit breakers shall be UL listed as type SWD for lighting circuits.
3. Provide spare circuit breakers matching the circuit breakers in the panel for minimum of 15% of the total number of poles in each panel (i.e. 42 Pole panel with 25 – 20A/1P active connected circuit breakers shall be provided with minimum 6-20A/1P spare circuit breakers).

F. Enclosure

1. Enclosures shall be at least 20 inches wide and 5 3/4 inches deep made from galvanized steel. Provide minimum gutter space in accordance with the National Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, an auxiliary gutter shall be provided, sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
2. Enclosures shall be provided with removable blank ends.
3. Panelboards shall have NEMA 3R enclosures unless otherwise noted.

G. Nameplates

1. Each panel shall have an engraved nameplate for each section. Engraved nameplate shall include panel designation, voltage, phase, ampere rating of upstream feeder breaker or main circuit breaker, and designation of upstream panel or other device similar to:

PANEL L42
100 AMPERE, 480/277 VOLT, 3 PHASE, 4 WIRE
FED FROM PANEL D42

2. Where panel is fed directly from an upstream transformer, nameplate shall be similar to:

PANEL D22
800 AMPERE, 208/120 VOLT, 3 PHASE, 4 WIRE,
FED FROM PANEL D42 VIA 225 kVA TRANSFORMER

3. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16 inch high, minimum.
4. Panelboards shall be provided with typewritten directories with plastic protector indicating circuit numbers, equipment served and room number of the area served. All room numbers used for directory cards shall be the room numbers assigned by the Owner and not necessarily room numbers indicated on the drawings. Coordinate all room numbers with Architect prior to final printing of directory cards. Directory cards shall be edited and maintained during the course of construction to keep an accurate, up to date record of each feeder or branch circuit.

H. Finish

1. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 49 or 61 paint applied.

2.3 SAFETY SWITCHES

- A. All safety switches shall be Heavy Duty type. General Duty type switches shall NOT be allowed.
- B. Provide disconnect switches as shown on drawings, with the following ratings:
 1. 30 to 1,200 Amperes.
 2. 250 Volts AC, DC; 600 Volts AC.
 3. 2-poles and 3-poles plus S/N.
 4. Fusible and Non-Fusible.
 5. Mechanical lugs suitable for aluminum or copper conductors.
- C. Construction
 1. Switch blades and jaws shall be visible and plated copper.
 2. Switches shall have a red handle that is easily padlockable with three 3/8" shank locks in the "OFF" position.
 3. Switches shall have defeatable door interlocks that prevent the door from opening when the handle is in the "ON" position. Defeater mechanism shall be front accessible.
 4. Switch assembly and operating handle shall be an integral part of the enclosure base.

5. Switches rated 30 amps to 600 amps shall have reinforced fuse clips.
6. Switch blades shall be readily visible in the "OFF" and "ON" position.
7. Switch mechanism shall be non-teasable, positive quick-make/quick-break type. Bail type mechanisms are not acceptable.
8. Fusible switches shall be suitable for service entrance.
9. Switches shall have line side shields.
10. Suitable for systems capable or 200kA at 480V with Class J, L, R, or T fusing as applicable.
11. Embossed or engraved ON-OFF shall be provided.
12. Double-make/double-break switch blade feature shall be provided.
13. Renewal parts shall be shown on the inside of the door.

D. Enclosures

1. Types
 - a. NEMA 3R
2. All safety switches shall have NEMA 3R rainproof enclosures unless otherwise noted.
3. Paint color shall be ANSI 61 gray.

E. All switches shall be UL-98 listed and meet NEMA Specifications KS-1.

F. All switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "ON" position.

G. Switches shall have line terminal shields.

H. Where safety switches are installed between variable speed drives and their associated motor, an interlock switch shall be provided on the safety switches and 2#14-1/2"C. shall run from the interlock switch to the associated variable speed drive to turn off the drive while the safety switches is in the off position.

I. All two speed motors shall be provided with 6-pole motor safety switches.

2.4 TRANSFORMERS - DRY TYPE DISTRIBUTION

A. Ratings

1. kVA and voltage ratings shall be as shown on the drawings.
2. DOE 2016.
3. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
4. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:

| | | |
|----|------------------|-------|
| a. | Up to 9 kVA: | 40 dB |
| b. | 10 to 50 kVA: | 45 dB |
| c. | 51 to 150 kVA: | 50 dB |
| d. | 151 to 300 kVA: | 55 dB |
| e. | 301 to 500 kVA: | 60 dB |
| f. | 501 to 700 KVA: | 62 dB |
| g. | 701 to 1000 KVA: | 64 dB |
5. Transformer shall exceed the minimum efficiencies as required by 2016 DOE.

B. Insulation Systems

1. Transformers shall be insulated as follows:
 - a. 2 kVA and below: 150 degrees C insulation system based upon 80 degree C rise.
 - b. 3 to 15 kVA: 185 degrees C insulation system based upon 115 degree C rise.
 - c. 15 kVA and above: 220 degrees C insulation system based upon 150 degree C rise.
2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient with a 30 degrees C average ambient over 24 hours.
3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

C. Core and Coil Assemblies

1. Transformer core shall be constructed with high-grade, nonaging, grain-oriented silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume

shall allow efficient transformer operation at 10% above the highest tap voltage. The core laminations shall be tightly clamped and compressed.

2. Coils shall be wound of electrical grade aluminum with continuous wound construction.
3. On units rated 15 kVA and below the core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moistureproof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level. Taps shall be two steps below nominal voltage in 5% increments.
4. On units rated 30 kVA and above the core and coil assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture. The assembly shall be installed on vibration-absorbing pads and securely bolted to the base to minimize sound transmission. Taps shall be two steps above and 4 steps below nominal voltage in 2.5% increments.
5. Transformers 112.5 kVA and above shall have impedance levels of 5% or higher. If the transformer impedance levels are below 5%, it shall be the Electrical Subcontractor's responsibility to adjust the short circuit ratings of all panelboards downstream of the transformer to a rating higher than the maximum theoretical let-thru current of the proposed transformer.
6. All dry type transformers shall be provided with internal vibration isolators, numbered terminal lugs extended to the cable compartment for external connections, and nameplate indicating all NEMA Standard nomenclature relative to the transformer.

D. Wiring/Terminations

1. Recommended external cable shall be rated 90 degrees C for encapsulated and 75 degrees C for ventilated designs. Connectors should be selected on the basis of the type and cable size used to wire the specific transformer.

E. Enclosure

1. The enclosure shall be made of heavy-gauge steel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees C. The core of the transformer shall be grounded to the enclosure.
2. Enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.

F. Finish

1. Enclosures shall be finished with ANSI 61 color weather-resistant enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes of material and equipment.
2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment provided under Part 2 of this specification as to proper methods of installation.
3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
5. The Electrical Subcontractor shall coordinate the electric service installation with NGRID Electric and the Owner.
6. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.

B. Electrical Distribution Equipment

1. The Electrical Subcontractor shall install the low voltage distribution equipment per the manufacturers recommendations and the Contract Drawings.

2. The installation of all equipment, including working space requirements, shall conform to all NEC and local codes.
3. All necessary hardware to secure the assembly in place shall be provided by the Electrical Subcontractor.
4. The Electrical Subcontractor shall ensure that no piping, ductwork or other equipment foreign to the electrical trade passes through the area extending from the floor to the structural ceiling with the width and depth equal to that of the electrical distribution equipment plus 6" on either side of panel.
5. Floor mounted assemblies shall be installed on concrete housekeeping pads and shall be provided with adequate lifting means. Floor mounted assemblies shall be capable of being moved into installation position and bolted directly to the floor without the use of floor sill.
6. Equipment mounted on sheetrock and studded walls shall not be attached directly to the sheetrock wall. Provide ½" plywood attached to wall studs or provide metal channel attached to wall studs for mounting of equipment.
7. All electrical equipment shall be installed such that the handle of the highest circuit breaker does not exceed 6'-6" above finished floor.
8. The location of all electrical distribution equipment installed in mechanical or plumbing equipment rooms shall be coordinated with the respective Subcontractor.
9. The equipment shall be installed and checked in accordance with the manufacturer's recommendations prior to first energization. This shall include but not limited to:
 - a. Checking to ensure that the pad location is level to within .125 inches.
 - b. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations.
 - c. Assemble all shipping sections, remove all shipping braces and connect all shipping split mechanical and electrical connections.
 - d. Secure assemblies to foundation or floor channels.
 - e. Measure and record megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four-wire systems only).

- f. Inspect and install all circuit breakers, components, etc. in their proper compartments.
- 10. Control wiring shall be provided as required. Interface all local and remote control wiring and operational systems for each load.
- 11. Recessed and surface mounted equipment shall be mounted on walls with studs and cross-bracing, as required to assure sufficient strength so as to restrict any movement of the equipment.
- 12. Dry Type Transformers
 - a. Floor mounted transformers shall be mounted a minimum of 6" from walls with proper clearance in front. Floor mounted transformers shall be installed on non-metallic, vibration isolating pads meeting seismic requirements and selected for at least 0.2" deflection. Panelboards shall not be mounted on wall above transformers.
 - b. Trapeze mounted transformers shall be supported with threaded rods and channel and shall be isolated with hanger isolators meeting seismic requirements and suitable for the weight and size of the transformer.

3.2 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.

- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.3 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Electrical Subcontractor in installation and start-up of the equipment specified under this section for a period of 2 working days. The manufacturer's representative shall provide technical direction and assistance to the Electrical Subcontractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The Electrical Subcontractor shall provide three (3) copies of the manufacturer's field start-up report before final payment is made.

3.4 TRAINING

- A. The Electrical Subcontractor shall provide a training session for the Owner's representatives for 3 normal workdays at a jobsite location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.
- C. The training program shall include the following:
 - 1. Review of the project one-line drawings and schedules.
 - 2. Review of the factory record shop drawings.
 - 3. Review of all equipment in the electrical distribution system.
 - 4. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
 - 5. Provide three ring binders to participants complete with copies of drawings and other course material covered.

END OF SECTION

PAVEMENT MARKINGS

SECTION 32 17 23

PART I - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 07 18 00 – Vehicular Traffic Coatings

1.3 SCOPE OF WORK

In general, the General Contractor shall supply all labor, materials, equipment, temporary protection and heating, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice. The work under this Section generally includes the following:

- A. Prior to removal of existing waterproofing, Contractor shall field measure and provide fully dimensioned as-built drawing indicating layout of parking spaces, no-parking zones, directional arrows, etc.
- B. After complete cure of waterproofing system, apply traffic marking paint to match original configuration. Use stencils as required to provide straight, consistent traffic markings.

1.4 REFERENCES

- A. AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 1986 Edition, as amended.
- B. Massachusetts Highway Department "Standard Specifications for Highways and Bridges", Latest Edition.

1.5 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the Building, occupants and the surrounding landscaped and paved areas.

- B. Coordinate the work in this Section with the work by other trades to ensure the orderly progress of the Work.
- C. Materials which have a temperature other than the application temperatures recommended by the manufacturer shall not be applied.

1.6 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 30 00 – Shop Drawings and Submittals.
- B. The Contractor shall submit the following items with their submittal package.
 - 1. Product data for specified materials.
 - 2. Material safety data sheets for all components

1.7 QUALITY ASSURANCE

- A. A minimum of two (2) test strips shall be installed prior to full-scale application of the pavement marking paint. The test strips should be allowed fully cure and adhesion test shall be performed. Adhesion tests shall be performed by material manufacturer representative or approved testing agency. Contractor to coordinate with material manufacturer.
- B. Prior to Contractor ordering or purchasing pavement marking paint, the Contractor must submit the traffic coating manufacturer's letter of approval to indicate compliance of all materials.

PART 2 - MATERIALS

2.1 PAVEMENT MARKING

- A. Pavement marking paint shall be a premium quality waterborne acrylic alkyd traffic marking paint such as Pro-Park Waterborne Traffic Marking Paint as manufactured by Sherwin Williams or approved equal. Marking paint color to be selected by Owner.

2.2 APPLICATION REQUIREMENTS

- A. No thinners shall be used for the above listed pavement marking applications except in accordance with the manufacturer's specifications and at the direction of the Engineer.
- B. Minimum finished paint thickness shall be 15 mils.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Traffic system top coat shall be allowed to cure a minimum of 48 hours prior to application of pavement marking test strips.
- B. All surfaces shall be cleaned to be free from dirt, debris, oils, foreign materials, etc. within the areas to be painted.
- C. Application of markings shall not proceed until final authorization is received from Engineer and traffic system manufacturer.

3.2 INSTALLATION

- A. All permanent pavement repair areas shall be repainted to match the original pavement markings.
- B. Painting shall be in accordance with Section 860 of the Massachusetts Highway Department "Standard Specifications for Highway and Bridges", Latest Edition.
- C. No paint or pavement marking material shall be heated above the temperature marked on the container.
- D. All painting shall be performed in a neat and workmanlike manner.
- E. Lines shall be sharp and clear with no feathered edging or fogging.
- F. If for any reason material is spilled or tracked on areas not being painted or any markings applied by Contractor, in Engineer's judgment, are not acceptable, then the Contractor shall remove such material by a method that shall not damage the new waterproofing surface and is acceptable to Engineer, clean and prepare the surface for a reapplication of markings, and reapply the markings as directed without additional compensation for the corrective work.

3.3 PROTECTION

- A. Markings shall remain protected until sufficiently dry to bear traffic.
- B. Precautions shall be taken to prevent tracking by tires of the striping equipment.

END OF SECTION

This Page Intentionally Left Blank.